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NEUROLOGICAL SURGERY THROUGH THE YEARS OF WORLD WAR II

LOYAL DAVIS, M.D., F.A.C.S., Chicago, Illinois

NEUROLOGICAL surgery received its greatest impetus from two sources. The first was a great personality who chose that field of surgery for his life's work and whose intellect, ability, capacities, and idealisms quickly called attention to the opportunities for surgical therapy and research which challenged solution. The second was the occurrence of World War I and the large number of soldiers who suffered from injuries of the brain, spinal cord, and peripheral nerves.

The many contributions made to surgical progress by the men who devoted their energies to the problems of neurological surgery in the interim between the end of World War I and the beginning of World War II laid the foundation for the expectation of better results than were compiled in 1918. It appeared likely that improvement would depend on newly acquired and more widely practiced surgical skills and upon the new antibiotics which seemed to offer such great assistance in meeting the challenge of compound wounds of the nervous system. It was hoped that the confusion and failures of the military medical services in World War I in assimilating the necessary and tremendous numbers of civilian doctors suddenly brought into their corps would be avoided by 25 years of peace in which their leaders would have been able to work out a smooth organization.

Department of Surgery, Northwestern University Medical School.

ORGANIZATION

Between World Wars I and II the British Army had recognized neurological surgery as a specialty and, after Munich, plans had been formulated for utilizing in the most efficient way the limited number of neurological surgeons available to the Army. This was accomplished by the appointment of a Consultant Neurological Surgeon to the Director General of the Army Medical Services, who made the policies and assigned responsibilities, as he desired. He was not tied to a desk at the War Office, but, on the contrary, had the greatest freedom in keeping in touch with patients, with university research which was applicable to neurosurgical problems, and with neurosurgical trainees. At the same time the Consultant was able to maintain close contact with the Director General and his group of administrators at the War Office.

In contrast, the American Army was decentralized into theaters of operation, in one of which there was a Consultant Neurological Surgeon and in two of which the responsibility for the direction of neurosurgical policy was assumed by the general surgical consultant. A neurosurgical consultant to the Surgeon General in the zone of the interior functioned only through the Chief Surgical Consultant. All of these individuals acted separately and, as a matter of fact, liaison and consultation between them on neurosurgical policies was actively discouraged. The neurosurgical consultant in a theater of operations was therefore independent and unaware of the policies for the

care of patients, which were being developed and established in the zone of the interior. The immobilization of surgical consultants in a theater of operations in the United States Army was complete and fixed. As a matter of fact, this fundamental policy even made it impossible for a neurosurgical consultant to the Chief Surgeon of a theater of operations to extend his functions to wounded soldiers of the Air Corps of the United States Army. If the results of the treatment of the wounded in World War II fall below the expected standards, and by this is meant all of the knowledge which should have been gathered from the terrible casualties of war for the benefit of mankind, it can be traced directly to the fetish for organization of echelon upon echelon and the desire for command function which placed the Surgeon General of the Army under the command of the Army Service Forces. From an administrative point of view, medical personnel was handled as were rations, guns, clothing, and other supplies by nonmedical commands which were wholly unable to understand or visualize medical needs and problems.

In every respect the Bureau of Medicine and Surgery of the Navy organized and administered its consultation service in neurological surgery more efficiently and more logically. The Consultant directed the policies of neurological surgery throughout; he had the personal opportunity of meeting the challenge of wounds which confronted the men whom he had assigned to their posts; he had mobility, and his chief had independence of command.

Whether or not unification of the military services will extend to the unification of medical service to the wounded individual of another war, whether he receives a fractured femur in a tank, on a battle ship, or in an airplane, remains to be seen. The probabilities are, however, that the desire for command, rank, and personal glory will again prevent a simple direct organization for the care of the wounded man and there will be separate medical services with officers who dare not enter the hospital of another's service without permission through the line of command. This anomalous and wholly unjustifiable situation existed in World War II between the Medical Corps which served under the Army Service Forces and the medical officers who served the Army Air Forces. It materially delayed the proper treatment of the wounded in several instances. Specifically, and to give one example, it permitted obstruction and delay in putting into effect proper therapeutic and prophylactic measures against high altitude frostbite.

One of the factors to which Sir Hugh Cairns attributes the achievements of the neurosurgical units of the British Army was the rather large group of regular British Army medical officers who were in close touch with the progress of medicine, who recognized the value of neurosurgery to a modern army. These men, who were the administrators, understood neurosurgical requirements and were prepared to develop all the facilities necessary to apply newer therapeutic methods. However, the total lack of a sufficient number of regular medical officers, who had even a basic knowledge of what was necessary to obtain good neurosurgical results, in the lower echelons of the Army of the United States, where obstructive tactics can really be successfully employed, was appalling.

In the British Army it was considered necessary to be as economical as possible in the use of professional personnel. The method of using neurosurgical and neurological specialists in mobile neurosurgical units proved to be a very successful and efficient one. There were 6 such units in action overseas and in the last 3 years of the war they dealt with 20,000 patients. The mobile neurosurgical units were flexible enough to meet the changing conditions of warfare. Very often a unit served as a special center attached to a general hospital, but frequently it was divided into forward and rear sections separated from each other by from 10 to 1,000 miles. Obviously, during a battle the forward section was the busier, while between battles the situation was reversed. Thus, personnel could be transferred from one section to the other as was desired. Again, these units provided for continuity of treatment of the patients, and the forward surgeon could learn the results of his operations because the keeping of records was thorough even in the busiest times.

A similar plan by which the activities of a surgical unit were divided between forward and rear areas was in use in the Red Army. The results of the continuity of treatment effected by a direct line of evacuation of the wounded from the forward unit to its general hospital in the rear were strikingly illustrated in the fields of neurosurgery and fractures.

The Chief Surgical Consultant to the Red Army Medical Corps was Burdenko, whose interest in neurological surgery was responsible for the Neurological Institute in Moscow. Obviously, the specialty did not suffer from a lack of understanding of its problems in the care of the war wounded.

In the American army, the policy was to do as little operating as possible in the forward areas be-

cause the tables of organization in the forward hospital units made no provision for neurosurgical operations. In the zone of communications, neurosurgeons were attached to general hospitals but often under the appellation of "septic" or "aseptic" surgeon. In the zone of the interior, a neurosurgeon with a properly equipped service was established in the large general hospitals. Neurosurgical teams consisting of a qualified neurological surgeon, an assistant, anesthetist, nurses, and orderlies were a part of a large auxiliary surgical group, and many of the teams were assigned to evacuation hospitals, which were fixed large bed units, without proper flexibility or mobility. No neurosurgical unit in the Army of the United States had a trained neurologist assigned to it as one of its component members. Cairns has said, "At all levels of neurosurgical work in the Army (British) co-operation of neurologists and neurosurgeons proved to be essential." The observations of Ritchie Russell and his colleagues upon the sensory disabilities resulting from lesions of the parietal cortex are invaluable. That neurologists and neurological surgeons can co-operate in the American Army and produce a successful result is attested to by the contributions which came from the combined electrodiagnostic and electromyographic study of peripheral nerve injuries which was carried on in one of the large general army hospitals in the zone of the interior. Part of the responsibility for the failure to use neurologists properly in World War II by the Army of the United States must be laid, where it belongs, upon the apathy and almost total lack of interest exhibited by the neurologists of this country in presenting the opportunities for service to the wounded and in research which their specialty could offer. The specialty of neurology in World War II was completely overshadowed and many of its leaders were overwhelmed by psychiatry. Whether or not the latter specialty will have made any lasting contribution to either the care of the wounded or the civilian population as a result of experiences in the war still remains to be proved.

The National Research Council organized committees in the various fields of medicine and surgery under the auspices of the Office of Scientific Research and Development. Contracts were made between the latter and responsible investigators usually associated with medical school faculties, for financial grants to aid research which was deemed to be of value in prosecuting the war. On the whole, the application of the results of the research was quite direct. The Subcommittee of Neurosurgery was established under the Committee of Surgery and was very active in stimulating and encouraging research that yielded results which were of value to the war effort in the care of the wounded.

It is questionable whether the organizational problems and difficulties encountered by the civilian medical profession, when it was called upon suddenly to assume the tremendous responsibilities of World War II, will be avoided in any future conflict. The bureaucracy of the War Department does not learn its lessons easily and, even if it did, its inflexibility is stupendous. The only hope is that there will be in peacetime a sufficient number of alert, intelligent, and aggressive doctors in the regular army medical corps who will keep abreast of the advances in medicine and who will be receptive to the requirements of the civilian doctor when he is called to war. The civilian professional in every specialty in turn must do his share to educate the regular army medical officer to the needs of progressive medicine in time of war.

CRANIOCEREBRAL WOUNDS

That the brain and meninges were able to resist infection to a remarkable degree was a fact that had been learned in World War I. The fact that Cushing recognized that it was usually infection which had defeated him in the surgical treatment of head wounds, that is, meningitis, abscess, and encephalitis, did not change that fundamental fact. Consequently, in the last war the problem was one of assisting the brain to exercise this power, perhaps by more expert handling and by intelligent use of the newly discovered antibiotics.

In World War I, Cushing's mortality in moderately deep head wounds was 36.6 per cent; in the cases in which the ventricles were opened it was higher, while in through-and-through wounds of the head and in the wounds of the brain which also involved the paranasal sinuses or the mastoid, the mortality was from 70 to 80 per cent. Jefferson estimated that of 28 of his own patients in World War I with head wounds, only 4 had died because of the irrecoverable nature of the brain injury itself. In all the others death was due to infection. In World War II not only did a larger number of patients with head wounds survive but, what is more significant, the percentage rate of primary healing, which is so important in these wounds, was about 85 per cent.

Anaerobic infections, particularly gas gangrene, had overwhelmed the surgical procedures in World War I, and it was thought likely that penicillin and the sulfonamides would not be the com-

plete answer to the invading clostridial organisms present in cultivated earthy soils. The reports of the British 21st Army Group, which fought in World War II over the same area in which many of World War I battles took place, showed that gas bacillus infections were not as frequent as they had every right to expect from the reports of the 1914–1918 experiences. In 11 months a total of only 356 such infections was encountered, and the recovery rate was 78 per cent.

Graschenko studied the bacteriology of craniocerebral wounds in the Red Army and stated that after 3 to 4 weeks, 12 per cent of the wounds showed a flora of pathogenic anaerobes, 20 per cent showed aerobes, 70 per cent showed cocci and from 8 to 10 per cent were infected with putrid anaerobes. Of the 20.3 per cent of patients in whom pathogenic anaerobes were found, 1.4 per cent died in 6 or 7 days of severe gas gangrene infections. Subacute anaerobic infections of the brain were found in all large brain fungi, and of 12 patients with such infections, 9 died. Thirty-two cases of chronic anaerobic infection of the brain were studied and among these there were 10 deaths. Among 34 cases of mild anaerobic infection of the brain which were studied there were no deaths. Graschenko found the Clostridium perfringens (Clostridium welchii), Clostridium sordelli, Clostridium fallax, Clostridium oedematiens, Clostridium oedematiens maligni, and the Streptococcus anaerobicus to be the prevalent anaerobic organisms. A polyvalent serum was used against gas gangrene infections which contained the Clostridium histolyticum, Clostridium perfringens, Clostridium oedematiens, and Clostridium oedematiens maligni. Prophylactic doses of 10,000 international units were given intramuscularly and therapeutic doses of from 30,000 to 40,000 units were used intravenously and intramuscularly. When the surgical mission to Russia visited Moscow in 1943, Graschenko had at his disposal gramacidin, but not penicillin. The sulfonamides were used intravenously, and in 1 case 10 c.c. of an 0.8 per cent solution were injected into the spinal fluid every day for 12 days with a successful recovery and without damage to the patient. Sulfathiazole, sulfanilamide, and streptocide (sulfapyridine) were then available.

Surgical technique. In World War II, suction, electrosurgical apparatus, and the hemostatic agents, such as fibrin foam and gelatin foam, were the outstanding technical contributions to surgery which aided the neurological surgeon. The principles of excision and primary suture which had been laid down by Cushing and others were the basis upon which the treatment of uncomplicated wounds of the brain was evolved. Early in the war, many head wounds which were partly excised in the forward areas of the British Army were then seen after more than 1 week following the injury at the neurosurgical units. Ascroft reported upon 276 patients with brain wounds who were treated in the Middle East, in 1943; 75 of these developed brain abscess and many required more than one additional operation before they could be cured of the infection. He showed that in a high proportion of these cases, retained bone fragments in the brain were the cause of the abscess. He advised immediate reoperation upon all patients of whom the x-ray films of the skull showed bone chips or a single large chip present in the brain, even if the external wound had healed primarily and the patient was free of symptoms. Obviously, retained macerated cerebral tissue, which made a peculiarly favorable media for the growth of bacteria, was also retained with the bone chips. This principle, however, was confirmed time and time again in the American army. When the British neurosurgical units, with their extreme mobility, received their head wounds early and performed meticulous exicision of the wounds, they closed them and obtained healing per primam. The incidence of postoperative infection and any need for second or third operations decreased. As time went on the importance of an incomplete débridement of a wound track with resultant hematomas and eventual respiratory embarrassment was more and more apparent.

In World War I Cushing had emphasized the tripod incision for repairing scalp defects. In World War II, advancements in the field of plastic surgery pointed the way for the use of sliding and rotation flaps of the scalp to cover a defect produced by thorough excision of a scalp wound. This materially reduced the incidence of cerebral fungus and good healing resulted, so that eventually the tripod or relaxing incisions were abandoned.

Fascia lata and pericranium grafts and, later, fibrin film, were used to close defects in the dura mater. It was found necessary to close penetrating wounds which involved the paranasal sinuses, and large defects in which postoperative herniation of the brain would be followed by serious cerebral damage. German neurosurgeons advocated the routine closure of all dural defects to prevent postoperative infection and the formation of a fungus. This procedure was followed by some inexperienced American neurological surgeons to the point of absurdity, but the experi-

enced American neurological surgeon confirmed the fact, first established by the British, that careful excision of the wound and meticulous closure of the scalp were the most important factors in preventing postoperative infection, and not closure of the dura mater, except in the instances mentioned above.

Martin and Campbell clearly stated the principle concerning the use of drainage in craniocerebral wounds. Their view was that in deeply infected wounds of the brain a drain was unnecessary if débridement was done thoroughly, but if débridement was not complete a drain did not suffice. There was some disagreement with this viewpoint, nevertheless in the closing stages of the war the use of drainage became less common.

The operative treatment of craniocerebral wounds may be summarized by saying that it was based upon an ever increasing ability of the surgeon to cleanse and débride the track of the wound thoroughly. Closure of the scalp and dura with more extensive employment of technical methods of plastic surgery was an evolution which materially affected the successful results obtained. Whereas in World War I the wound track was débrided and cleansed by syringing, in World War II the track of the wound was visualized and cleansed by suction with emphasis upon the removal of all foreign materials, blood clots, and pulped brain tissue. It was concluded that these materials were far more dangerous than the risk of spreading contaminated material through the brain at operation. In World War I the dictum was that wounds more than 24 hours old should be packed open, which in fact was followed in other wounds of the body in World War II. Seriously contaminated wounds of the brain and other wounds seen 3 days after injury or even later were closed after complete cleansing and débridement. Purulent wounds were also closed completely by the British with a small tube left in place for the introduction of penicillin.

Chemotherapy. It has become a trite statement that the sulfonamides and penicillin are not substitutes for meticulous surgical procedures. However, there are those craniocerebral wounds in which pathogenic organisms gain access to the subarachnoid spaces or ventricular system regardless of the care with which operative procedures have been carried out. Toennis reported a large series of deaths in the German army from infection of the brain and its meninges after wounds of the paranasal sinuses. Cushing and his team in France in 1917 lost almost 1 of every 3 patients from ventriculitis, meningitis, or some other type of brain infection.

Cairns and his colleagues advocated the use of 18 gm. of sulfadiazine on the first day and 12 gm. daily thereafter in the treatment of meningitis. In fact, this drug was used as a prophylactic measure. It is obvious that the proper *p*H of the urine must be maintained to avoid renal complications, and it has been found that this can be accomplished best by the intravenous administration of N/6 sodium lactate solution. Powdered sulfonamides had been applied locally to brain wounds and Ascroft reported no ill effects therefrom. However, Pilcher and others in America showed that sulfathiazole, particularly, produced convulsive seizures when applied directly to the brain. Isotonicity and neutrality are the important factors when any substance is brought into contact with the brain.

Cairns and his colleagues also established that penicillin given intrathecally is successful in the treatment of meningitis from organisms susceptible to penicillin, provided of course that there is no block in the cerebrospinal fluid pathway and that the source of the infection has been adequately treated. They showed also that in grossly infected wounds with superficial suppuration, cellulitis of the scalp, osteomyelitis of the skull, and infected brain fungus, systemic administration of penicillin is of great value. Contrary to the workers in America, they saw no convulsive seizures develop from the intrathecal or intraventricular use of penicillin when the proper dosage was given. The work of Wyck in Australia confirms these findings, as do experiences with individual patients presenting pneumococcic meningitis in civilian practice. The relative value of local and systemic administration of penicillin in the prevention of gram-positive infections after the excision and suture of brain wounds was not completely proved by Cairns and his co-workers, but it must be emphasized that it was the facility with which Cairns, the Consultant in Neurological Surgery to the British Army, moved about, saw results first hand, and had the opportunity to encourage and stimulate his younger colleagues in their work that made these valuable fundamental contributions possible.

Penetrating wounds and retained missiles. In an attempt to determine the exact course of events in penetrating wounds of the brain, Pilcher studied a group of dogs into the heads of which unsterile foreign bodies penetrating the ventricle and still protruding through the skin invariably produced a rapidly spreading and fatal infection of the meninges, brain, and ependymal lining of the ventricles. If a foreign body was removed within 12 hours the incidence of fatal infection was

greatly reduced. Failure of the foreign body to reach the ventricle greatly reduced the likelihood of death from a fulminating infection. Pilcher concluded that an unsterile foreign body, deeply imbedded but not communicating with either the skin or the ventricle, does not cause fatal infection unless at some time the ventricle was penetrated. His experiments, therefore, showed that a foreign body communicating with the skin, subarachnoid spaces, or ventricle should be removed as early as possible, but if the object is located deep within cerebral tissue and does not communicate with the ventricle or the outside, it is usually best to leave it in place unless local destructive symptoms develop. In the British Army, missiles in the brain were removed in less than one-third of the cases in which they were present. Ascroft, in 1943, concluded that it was retained bone chips rather than the retained missile which gave rise to a brain abscess, but later in the war the occurrence of abscess about a missile, although the bone chips had been completely removed, was frequent enough to direct closer attention to removal of the missile. Electromagnets were replaced for the most part by the simple procedure, advocated by Schorstein, of using a piece of magnetized steel held in a pituitary rongeur.

Relatively speaking, the occurrence of intracranial hematoma is uncommon in missile wounds of the brain. Ascroft reported that intracranial hematoma caused death in 13 of 359 fatal cases of brain wounds. Schorstein reported 57 recoveries in 83 cases and called attention to the fact that hematoma occurred most often as the result of small penetrating missiles of high velocity when the wound of entry was too small to allow escape of the clot.

Reference has been made to the experience of the German army, that brain wounds which involved also the paranasal sinuses were overwhelmingly fatal. In civilian neurological surgery the problem of closing a dural defect of the anterior fossa which communicated with the frontal sinuses had been attacked in several ways and its importance was widely recognized. At the Head Injuries Hospital in Oxford, England, during World War II, 400 operations were performed for closure of the torn dura over the paranasal sinuses. As experience increased it was found there that intradural repair with fascia lata through an osteoplastic flap was the most satisfactory method. However, each wound presents a specific problem and often exenteration of the sinuses or an extradural method of repair proves more effective. The time and place for such operations, which are time consuming if they are performed as they should be—with meticulous regard for details—may be difficult to prescribe in war injuries. Certainly, they should not be undertaken routinely under less than ideal conditions, as they were in some units of the American army.

Repair of skull defects. In the American army it became the policy early during World War II to repair skull defects by the use of various types of material, but finally tantalum was most widely used, while acrylic resin was less frequently employed. In civilian life prior to World War II, several neurological surgeons had employed acrylic resin in several instances and found it to be quite satisfactory. There was no established policy for the repair of skull defects as far as size and location of the defect, the time and place for repair, or the symptoms which indicated the need for skull repair were concerned. As a result, small defects of the skull without accompanying symptoms of any kind were covered with a tantalum plate as frequently as large defects in the frontal area with accompanying loss of the orbital ridges. In only one Army general hospital in the United States were preoperative encephalograms or ventriculograms taken to provide an accurate record of the state of the ventricular system and subarachnoid spaces before the tantalum plates were applied. The policy regarding resection of the underlying scar of the brain varied with the individual neurological surgeon from resection of the brain down to the underlying ventricular wall to no interference whatever, not even dissection of the dura mater away from the overlying edges of the defect. In no Army general hospital were postoperative air studies performed as a part of the procedure of closing skull defects. Therefore, in the majority of instances the operation became a mechanical one of carpentry. As a result, the effect of closing skull defects by plastic methods upon the occurrence of epilepsy following head wounds, or the change in status of the ventricular and subarachnoid systems following the operation will never be accurately determined in the American wounded. Neurological surgeons now engaged in service in the Veterans hospital facilities are obliged to remove tantalum plates from the skulls of patients in whom they were placed unwisely because of persisting infected and draining sinuses and osteomyelitis of the surrounding bone. The advantages of acrylic resin over tantalum on x-ray studies of the ventricular and subarachnoid systems are obvious.

Posttraumatic convulsions. The frequent occurrence of convulsive seizures following craniocerebral injuries of warfare has been a matter of great concern since World War I, as Schmidt pointed

out. In some patients the injury to the brain is so great that regardless of their care, convulsions may be expected to occur. In others, unwise surgery, particularly injudicious zeal in extracting an indriven missile with no regard for the destruction required to remove it, or infection of the brain, meninges, and skull may be etiological factors. Ascroft reviewed the case histories of 317 patients who received cerebral gunshot wounds in World War I in 1941. One hundred seven of these patients suffered from convulsive seizures 4 years or more after receiving their wound. Thirty-three of this number were having major convulsions with a focal onset, frequently an aura. Many cases of petit mal seizures were of a focal character. Attacks were twice as frequent in the cases of cerebral injury in which the dura mater was penetrated, compared to the cases of injury without dural tears. Patients from whose brains metallic foreign bodies had been removed were much more commonly subject to convulsions than patients who had not undergone such surgery at the time of their injury or who still retained the missile. Scalp wounds of all kinds were followed by convulsions in 24 per cent of the patients, probably because of the more severe underlying brain injury than that occurring with the usual scalp injury in civilian life. Ascroft also found that although convulsions more certainly follow direct injury to the sensorimotor cortex than injury to some area removed from the rolandic area, yet the exact site of cortical damage did not seem to have such an important bearing on the production of convulsions. The first seizure might occur within a few hours or as late as 20 years after the original injury, but usually the onset of convulsions was sometime during the first 2 weeks after injury.

Protection against craniocerebral injuries. According to Cairns, little work was done on the protective value of the steel helmet against craniocerebral wounds. However, there were many individual cases in which what would probably have been a penetrating wound presented itself as a simple wound of the scalp and skull because of the helmet. Cairns perfected and had adopted a protective helmet which was worn by motorcyclists in the British Army, and its value was demonstrated on many occasions.

The regular issue steel helmet worn by the American soldier admittedly furnished excellent protection against craniocerebral injuries. However, it was not designed for the use of the crews of aircraft or tanks and could not be used to advantage by them, mainly because of its size, shape, and weight. Nevertheless, the desire of one copilot for protection to his head from bursting 20 mm. Oerlikon shells led him to remove the liner of his helmet and pull on the outer steel shell over his regulation leather flying helmet. The effectiveness of this protection was emphasized by the fact that his pilot, wearing only a leather helmet, was struck in the head by the fragments of an Oerlikon shell which burst between them. He immediately lost consciousness, developed a left hemiplegia, and a complete left homonymous hemianopsia. While the copilot's helmet was punctured in several places by the high velocity fragments, it afforded complete protection from even a scalp laceration.

It became obvious that members of an aircrew needed adequate protection from craniocerebral injuries. However, any helmet designed for their use had to meet certain specifications.

1. It had to be close fitting and comfortable so that it would simulate as closely as possible an ordinary leather flying helmet and be considered a personal possession which might gather "good luck," like a favorite, battered felt hat.

2. It had to allow free and unrestricted movements of the head in all directions, and could not interfere in any way with the field of vision.

3. It had to be light in weight and afford protection from the heat and cold.

4. It had to afford protection, at least equal to that afforded by the regular issue steel helmet, against craniocerebral injuries produced by fragmenting Oerlikon shells and antiaircraft flak, or concussion due to direct, blunt trauma. If these requirements could be met for aircrews the same type of helmet would serve for tank crews that used a fiber helmet which the soldier found unsatisfactory for protection, efficiency, or comfort.

The percentage of wounds to the head, comparing its surface area to that of the body, is approximately 12 per cent. It was found that the larger number of craniocerebral injuries in airmen resulted from the fragmentation of 20 mm. Oerlikon shells, followed in turn by the larger pieces of antiaircraft flak, and concussion due to direct trauma. When an Oerlikon shell bursts, it fragments into thousands of pieces which vary in weight from less than 1 mgm. to 20 gm. However, the largest number of "effective" Oerlikon shell fragments bursting in an area 5 feet in diameter and capable of causing incapacitation to the person exposed is 260. The majority of these 260 fragments weigh between 10 and 50 mgm. and their velocity varies between 400 and 600 meters per second.

Many materials were suggested and subjected to accurate ballistic and other tests. It was finally

concluded that an acrylic resin, properly manufactured, offered the largest number of advantages for the purpose and most closely met the specifications for velocity resistance, tensile strength, impact resistance, hardness, specific gravity, inflammability, nonconduction of heat and cold, and tissue reaction. A model helmet was made by molding pieces of acrylic resin to conform to the frontal, temporal, occipital, and vertex portions of the skull covering them with leather, and lining them with chamois skin and fleece. Such a helmet allowed for complete movement of the head in all directions, provided complete protection over the frontal and occipital areas, and weighed 18 ounces, compared with the steel body of the regulation helmet which weighed 35.84 ounces. A commentary on the organization within the Army is that this type of helmet was field-tested and adopted for Marine and Navy flyers, but further work upon it by the Quartermaster Corps of the Army was prevented by a directive which forbade this corps to interest itself further in protective clothing of any description for the Army Air Corps.

Blast injuries. Investigation of the cerebral symptoms after blast injuries was carried on by Zuckermann and his associates for the Ministry of Home Security in Great Britain, where, of course, the greatest opportunity existed during the Battle of Britain. They found no evidence of cerebral lesions in experimental blast, and the cause of the clinical symptoms still remains in doubt. However, others did report hemorrhagic cerebral lesions in patients without any wounds of the head. Cairns believes that the possibility of cerebral fat emboli still remains in question, although in some cases fat was looked for in the brain lesions and not found.

Mechanics of craniocerebral injuries. A series of recent investigations has emphasized the facts that nerve tissue, blood, and cerebrospinal fluid have about the same density as water; that the brain substance does not change its size appreciably when subjected to hydrostatic pressure, and that the brain offers very little resistance to changes in shape as compared to the resistance it presents to changes in size. Obviously, the rigidity of the skull is enormous compared to that of the brain.

Deformation of the skull has been recorded electrically and is, as would be expected, most severe near the point of impact where there is compression distortion. Simultaneously on the opposite side, there is tensile deformation. Since the brain substance is extremely incompressible and yet easily altered in shape, its constituents are pulled apart in proportion to the degree of sliding type of deformation.

Another mechanism acts to injure the brain; it is due to the changes in velocity of the head produced by the blow. Linear or rotational acceleration forces, or both, may be set up, and of these the latter are the most injurious. The small amount of motion allowed the brain in its closed box is possible only because of the to-and-fro movement of the cerebrospinal fluid. When the head is subjected to rotational acceleration forces, the brain lags behind and a type of shearing strain results. Denny-Brown and Russell found it difficult to produce concussion in animals if the head was prevented from moving when it was struck.

INTRACRANIAL ABSCESS

The influence which the antibiotics have had upon the result of the surgical treatment of intracranial abscess has been almost miraculous. There was a time not far distant, however, when this intracranial lesion was one of the most disappointing which beset the surgeon. The sterilization of the contents of the abscess, the safety with which one can wait until the abscess wall is well established, the avoidance of ventriculitis and meningitis, and, finally, the success which has attended removal of the abscess in its entirety, without the development of widespread encephalitis, constitute a real contribution to this field of surgery. Chorobski has recently reported upon removal of the abscess in its entirety in 26 cases.

SPINAL CORD INJURIES

The record attained in the treatment of patients with spinal cord injuries in World War I was not an enviable one and the methods of treatment of traumatic paraplegia were not improved a great deal by the experiences of that war. The contributions of Riddoch, Holmes, and Head to the physiology of the spinal cord, which resulted from their meticulous study of the relatively few patients who survived following injury to the spinal cord in World War I, are unequalled in clinical observation. In the succeeding years the majority of the patients were injured in industrial or traffic accidents, and the greater part of the injuries were of the closed fracture-dislocation type. A second opportunity for improvement in the methods of treatment of spinal cord injuries was at hand with the beginning of World War II and the tremendous number of wounds of the spinal cord from every conceivable cause. It is doubtful if careful and accurate clinical studies of the 2,000 odd traumatic paraplegic patients who are still alive after World War II were made during the time

they were being cared for in military hospitals. Such studies are now being undertaken in Veterans Administration hospitals where these patients are now under care.

It is unfortunate that many paraplegic patients misunderstood the assurances given them by the Army that over 80 per cent of them would walk. These tragic individuals have learned in these last few years the difference between ambulating and walking. They, quite naturally, had expected to walk in the manner to which they were accustomed before their injury and irrespective of the level of that injury. This overenthusiastic approach did more harm than good and led to ill advised actions by members of Congress and other well meaning laymen which made the paraplegic patient consider himself in a group set aside from other seriously wounded and permanently handicapped veterans. The problems of the care and treatment of patients with paraplegia must be thoughtfully carried out to a solution. There is no doubt but that the problems of these patients have been built up too strongly in the public mind. They have become the center of much interest, not all medical, which may eventually make their care even more difficult. The very word "paraplegic" is objectionable. It is frequently heard from the lips of patients and lay persons, singling out and stamping these patients as doomed with a special and completely hopeless disability. A less pointed, less specific term should be adopted. These patients are seriously and tragically injured persons and should be treated as such, but they should not be singled out for overindulgent publicity from those with other types of injury just as serious and, in many cases, more disabling.

Surgical treatment. Even with the large experience gained from spinal cord injuries in World War II there is still no agreement upon a course of surgical procedure which should be carried out in the treatment of the patients immediately after injury. This should not be surprising. On the contrary, it is surprising that it should be expected that these injuries, which exhibit so many different symptoms, could be typed so strictly that any one particular group of therapeutic steps would be the correct one in all instances. The greatest unanimity of opinion, and undoubtedly the greatest contribution that has been made as a result of World War II experience, has centered on the rehabilitation of the patient. The high quality of the early care of the patients with spinal cord injuries in this war has kept them alive so that rehabilitation could be effected.

In the past, the term "spinal shock" has been used frequently and without critical meaning. The term should be discarded because attempts to interpret it often have deprived the injured patient of the sorely needed help of a surgical procedure. Any patient with an injury of the spinal cord, with or without concomitant injury to other parts of his body, may suffer from a fall in blood pressure, a low body temperature, and a poor pulse and give evidence of poor peripheral circulation. Unfortunately, the term is interpreted by some to mean that the patient has a complete anatomical section of the spinal cord because he may be flaccid and without reflex responses of any type below the level of his injury. As a matter of fact, early in the phases of a spinal cord injury the differentiation between a complete anatomical and a complete physiological lesion cannot be made upon the basis of clinical symptoms. It has been said that plantar flexion of the great toes is usually the only reflex movement that can be elicited upon scratching of the sole of the foot during the first few weeks after a complete transverse lesion of the spinal cord, and that the appearance of a Babinski sign within the first 2 weeks after injury is evidence of the incompleteness of the lesion.

Most surgeons will agree that the patient should be recovered from the primary shock of his injury before treatment is begun, whatever may be indicated. Similarly, most surgeons are agreed that the final position of the patient with an injury to the thoracic or lumbar spine, with or without cord injury, and whether or not the patient is subjected to laminectomy when the cord has been injured, should be that of hyperextension. Fixation upon a special hyperextension bed with a reverse spring mechanism, or by means of rolled blankets under the mattress, and without a plaster cast, should be obtained. Plaster casts, so dear to the hearts of the orthopedic surgeons, create many problems of nursing care, contribute to the formation of decubiti and add to the general discomfort of the patient. Manipulation of the spinal column to reduce a fracture-dislocation is only mentioned to condemn the practice emphatically. Some form of skeletal traction is preferable in the care of cervical fracture-dislocations, and to the majority of neurological surgeons the use of skull tongs has proved the simplest, most effective, and safest method of obtaining traction. It has become standard practice to apply tong traction early in cases of fracture-dislocation of the cervical spine when there is no open wound and when there is no evidence of indriven bone spicules or other foreign bodies.

The greatest point of contention in the treatment of injuries of the spinal cord concerns the

problem of when, if ever, laminectomy is to be performed. The Queckenstedt test offers the most reliable method of demonstrating the presence or absence of a block in the subarachnoid space, whether it be due to edema of the injured cord or to pressure upon the cord by dislocation of the vertebrae. It offers a method of following the release of that block by subsidence of the edema or by closed methods of re-establishing the free circulation of the cerebrospinal fluid. Or, it establishes the indication that a laminectomy must be performed to relieve the block. The surgeon cannot repair the injured spinal cord; he can only relieve compression and provide every opportunity for the spinal cord to regain its function. The differentiation between complete anatomical and physiological interruption cannot be made in the period which is important to the patient's future. Therefore, the Queckenstedt test is important in defining the responsibilities of the surgeon.

A large number of patients with spinal cord injuries who have had a subarachnoid space block from the time of their injury have been observed in a Veterans Administration hospital. In the majority of these cases, the continuity of the spinal cord had not been interrupted anatomically. One can only surmise what the course of the patient might have been had the subarachnoid space block been followed up persistently and the compression relieved early after the injury. If it was not relieved by closed methods of traction and hyperextension then certainly a laminectomy should have been performed to have given the patient every opportunity to recover part or all of his cord function.

Certainly, decompressive laminectomy weeks and months after injury rarely offers any benefit when evidence of a complete transverse lesion has persisted. However, this is not true, even in late operations, when the lesion has been incomplete and not progressive. Early or late, operation has much more to offer in injuries of the cauda equina than it does in injuries of the spinal cord. When the injury is in the cervical cord, skeletal traction should always be tried first. Early and premature cervical laminectomy, within the first few hours or days, is bad surgical judgment and is the one instance in which surgery contributes to the already poor prognosis of the case.

The open wounds of warfare require the usual meticulous débridement that all such wounds require. It was common practice in World War II to remove all bone fragments and make a clean toilet of the wound without opening the dura mater in the potentially infected field. Indriven spicules of bone and foreign bodies, if accessible, were removed. Dural rents were closed either by suture, if possible, or by the application of living fascial grafts in order to stop the cerebrospinal fluid leak. In the fresh open wound only the bone that was actually damaged or in danger of not remaining viable was removed. The excellent healing and frequent return of function, particularly in incomplete lesions, which resulted from such treatment has provided fresh hope in the care of these patients. The aid of systemic chemotherapy has been as great a boon in this field of neurological surgery as it proved to be in craniocerebral open injuries.

Rehabilitation. The time finally arrives in many injuries of the spinal cord, in particular those of the cervical and thoracic segments, when all active treatment for the injury itself is futile The patient must be prepared for existence as a bed patient, a wheelchair patient, or as an ambulant patient with the need for crutches, braces, or walker, this depending entirely upon the level of his lesion. World War II gave a tremendous impetus to the re-education of the patient with a spinal cord injury. The programs for the rehabilitation of these patients in certain Veterans Administration hospitals are being carried out on a broad and detailed scale, but they are no different, actually, from those which have long been advocated by many neurological surgeons in the care of patients with similar injuries received in civilian life. Carefully supervised recreation, physical therapy, occupational therapy, and study in trade schools are all parts of a general program to improve the morale of the patient, to help him readjust himself to a happy and, if possible, useful existence, and to give him the maximum chance for physical recovery. The great force promoting such a program has been, happily enough, the United States Government, as reflected through the care given these patients by the many civilian doctors who have given of their time and abilities to the Veterans Administration hospitals and the hospitals of the Army and Navy.

Late care of the patient. The primary responsibility of the care of the patient with a spinal cord injury should be that of the neurologist, with the aid of the neurological surgeon, the urologist, the orthopedic, general, and plastic surgeons, and particularly of the internist who can consult in problems of general medical care and nutrition which constantly arise. When the patient is thus handled, he requires no more special psychiatric care than any other type of patient with a chronic illness.

The special difficulties of nursing care are multiple and a large personnel is needed to give pa-

tients with spinal cord injuries a consistently maintained high level of attention. The daily nursing problems which attend the care of the bowels, bladder, decubiti, nutrition, cleanliness of the skin, and morale require a persistent attitude of optimism on the part of all the ward personnel. This cannot be obtained by the written order in the book; it must be implemented by the supervision of competent, interested doctors and nurses, particularly the latter whom the patient sees more than any one other person. A hopeful, friendly, interested approach has proved to be a great factor for good.

Nutrition. The value of the correct blood protein level and the albumin-globulin ratio has been demonstrated repeatedly in the care of these patients. The diet must be carefully supervised to provide a high protein intake and an average caloric supply of about 2,800 calories a day. It is not primarily the purpose to have the patient gain weight, although well fat-padded weight-bearing points are less likely to develop decubitus ulcers. It is the latter which seriously deplete the plasma proteins. A high vitamin diet is also desirable, and for the purposes of improving the status of the bladder a generous fluid intake should be urged.

Decubitus ulcers. Every meticulous detail of nursing care must be insisted upon to avoid rather than to heal the decubitus ulcer. Weight bearing points on the body must be rested frequently by turning the patient, and by massaging and drying the skin. Sheets must be clean and smooth. The skin must be bathed frequently and kept dry and free from feces, urine, and perspiration. Attention to the avoidance of decubitus ulcers must begin within the hour after injury and can never, for the rest of the patient's existence, be relaxed at any time. There is no questioning the fact that delayed and inadequate nursing care during the first few days after injury, in the theater of operations, was the main source of bed sores. It was for this reason, among others, that doctors insisted upon evacuation priority for these patients, oftentimes unsuccessfully against the obstinate obstruction tactics of laymen in other echelons who were preoccupied in the transportation of matériel and personnel designed to make their own existences more comfortable.

Once a decubitus ulcer has developed, it should be treated with all of the meticulous care necessary to prevent the introduction of further infection; as sloughs appear they should be carefully removed; the base of the ulcer which consists of granulation tissue should be kept fresh and clean. The use of ointments, no matter how brightly colored, upon the ulcer does not conform to the sound surgical principles established for the successful treatment of this kind of a wound. The purpose is to close the wound as quickly as possible after the disappearance of infection. This can be accomplished most quickly by excision and closure in the small ulcers, but in others free grafts or rotation flaps must be used. Eventually some ulcers will epithelize but the healing process is a slow and tedious one and the patient is handicapped in his rehabilitation by the long period required.

Development of automatic micturition. The establishment of efficient urinary function is one of the primary goals in the care of the patient with an injury of the spinal cord. It avails little to rehabilitate the patient successfully in various other spheres if eventually he does not have adequate control of his urine, for in such a chronically disabled patient the inability to void with some means of control will alone prevent his return to a socially acceptable state. Furthermore, proper urinary function, in so far as it can be developed, is important for the preservation of life itself.

It has been accepted as fact that the appalling death rate among the wounded of World War I who suffered spinal cord injuries was due to urinary sepsis probably induced by early repeated manual catheterization. It would seem that in World War II, the method of choice in the care of the bladder was early suprapubic drainage with a large tube placed well above the symphysis pubis. Later when the patient reached adequate hospital facilities, the tube was removed and replaced with a permanent indwelling catheter. It has been established as a principle by testimonials and not by proved facts that a suprapubic tube was necessary "for purposes of transportation." It was the experience of more than one neurological surgeon to receive the patient at a base hospital with urine oozing out around a plugged-up suprapubic tube (which promoted the formation of decubitus ulcers), with a necrotic fistula, or, on occasion, with the neglected tube rotted off and lying free in a mass of calculus in the bladder. The British have described a "trocar" method of performing the suprapubic cystostomy with insertion of the tube immediately above the symphysis, but observation of several British wounded with spinal cord injuries showed that this method of management was not proof against the thoughtless or careless doctor.

Tidal drainage, generally popular in America, requires attention from the doctor, nurse, and patient. It is not a simple, self-regulating mechanism as many assume, but it affords a means of continuous cystometric study; it is a means of

keeping at a minimum the bladder infection which is bound to occur, regardless of medication, when any foreign body such as a catheter is placed into the bladder, and it is the only certain and safe means of training the bladder into automatic function.

Urinary function in 500 patients with spinal cord injuries appeared in one of the following five forms: (1) early return to normal micturition, (2) eventual return of partial voluntary control of micturition, (3) involuntary dribbling of urine, or the frequent uncontrolled passage of very small amounts of urine, (4) absolute retention, a less common situation, and (5) automatic or reflex micturition, entirely free of any voluntary effort of the patient. If complete normal urinary control or partial voluntary control aided by special efforts on the part of the patient to empty his bladder cannot be obtained, the ideal condition is that of automatic micturition. Proper care of the bladder in the early stages of treatment is most important to insure the development of reflex emptying of the bladder when any return of normal power is impossible. Under ideal conditions an indwelling urethral catheter, placed immediately after injury, properly serviced, and connected with a tidal drainage apparatus adjusted for the particular needs of the patient, will lead to automatic micturition within a few weeks. The shortest period for such reflex function to become established in these patients was 5 weeks—in a patient with a lesion at the fourth thoracic cord segment. Such function was established in one patient with a complete lesion of the conus medullaris and cauda equina at the end of 2.5 months. In both instances the patient had no other type of bladder drainage than that of a small caliber Foley catheter. Tidal drainage was used from the beginning and urinary sepsis was kept at a minimum; urinary calculi did not develop and the nutritional state of the patients remained good. In numerous instances efficacy of the indwelling catheter with tidal drainage not only in the establishment of automatic micturition but also as an aid in restoring partial voluntary control has been proved. In no case did automatic micturition develop while a suprapubic catheter was in place. On the contrary, many patients developed such urinary control following the removal of the suprapubic tube, placement of an indwelling catheter, and training for a period of time thereafter with tidal or carefully controlled manual drainage. Severe urinary infection soon after injury was found to prolong greatly or obviate completely the development of automatic micturition, and such an infection many times has been observed to destroy an already well established automaticity.

Various methods of urinary drainage were used in the early days and weeks of treatment during World War II, not different from the practice in World War I. These included (1) allowing the bladder to distend and overflow, (2) manual expression, (3) perineal urethrostomy, (4) suprapubic cystostomy, (5) repeated urethral catheterization, and (6) the use of an indwelling urethral catheter. The exigencies of war alter treatment, but it is a moot question as to whether suprapubic drainage is necessary for purposes of transportation. Ample evidence is at hand that many suprapubic tubes, ostensibly placed for such purposes, were initially placed too high or too low and thereafter neglected, so that they became the source not only of severe urinary sepsis but also of the additional complication of bed sores.

Automatic micturition may occur in the presence of a complete lesion at any level in the cord or cauda equina. Of 77 patients with cervical lesions, 11 eventually developed automatic micturition. Of 288 patients with lesions at the various levels of the thoracic cord, 97 eventually developed such reflex activity. Of 106 patients with lumbosacral lesions, 17 developed automaticity. Under favorable conditions, therefore, automatic micturition may develop and continue regardless of the level of the lesion. It is not uncommon for the automaticity to be interrupted and require a secondary period of training when such complications as urinary sepsis, calculi formation, nutritional debility, decubiti, or severe mass reflexes occur. Automatic micturition develops most rapidly when the lesion lies below the seventh cervical cord segment and above the fifth thoracic. There is an increase of the time required for its development as the lesions descend into the lower thoracic cord, and most patients with lesions of the conus medullaris or of the cauda equina require from 8 to 20 months, or longer, to develop automaticity. These experiences corroborate the fact pointed out many years ago by Head and Riddoch that the completely isolated bladder without any intact distal segment of spinal cord can under the proper conditions develop and maintain the state of automatic reflex emptying.

Severe retention, as well as frequent dribbling of urine, with large residual capacities up to 1,200 c.c. in either condition, has been observed in the presence of a complete or partial lesion, at any level of the cord or cauda. Numerous instances of dribbling with high grade retention occur in many patients with cervical or thoracic

cord lesions whose early care was punctuated with many complications, or who were early denied the benefits of an indwelling urethral catheter and tidal drainage training. The occurrence of severe mass spasms of the extremities is common with lesions of the cord, and severe spasms usually so affect the bladder that it takes part in the general somatic spasm and tends to evacuate small amounts of urine at frequent intervals. Under such conditions it may contract down to a very small capacity, usually with little or no residual. These mass spasms affecting the bladder and lower extremities are of decreasing incidence as the lesions descend the cord and cauda below the tenth thoracic segment.

In the presence of lower thoracic or caudal lesions, when there is still some power of contraction in the abdominal muscles, the patient is aware of the need to void by such signs as a feeling of abdominal distention, burning or tenseness in the genitalia, suprapubic cramping sensations, or tenseness, burning, and drawing sensations in the lower extremities. When the lesion lies above the ninth or tenth thoracic segments, distention of the bladder and a warning of impending micturition may be manifested by such signs as flushing of the face, arms, and chest; perspiring on the upper half of the body; a feeling of sudden heat over the face and neck; nausea, or sudden severe headache. In the rare patient these latter signs may also be present with lower thoracic or caudal lesions, but in any event the symptoms are promptly relieved upon the emptying of the bladder. Upon becoming aware of such signs, many patients can initiate urination by such extravesical stimuli as massaging the lower abdominal wall, rubbing the skin of the inguinal region, tugging on one spermatic cord, or pinching the skin of the thigh. Patients with lesions of the conus or cauda do not respond as readily to such extravesical stimuli as do those with higher lying lesions. Yet if they are unobstructed at the bladder neck they may eventually develop some particular stimulus which will aid starting of the urinary stream, and while their automaticity is less likely to be efficient, they can aid the emptying of the bladder by suprapubic pressure and by holding the breath and tensing the abdominal muscles.

Many of these patients are found to have greatly hypertrophied bladder necks, and the operation of transurethral resection of the ring of hypertrophied muscle has been successful in producing a state of automatic micturition, with almost complete emptying every 1 to 3 hours. Also, the patients are frequently relieved of the uncomfortable burning in the groin, flushing of the face, perspiration, and headache which accompany such frequent attempts of a bladder working against resistance.

As a result of the studies carried out upon these 500 patients with spinal cord injuries in a Veterans Administration hospital, one may summarize by saying that automatic micturition will develop following a complete lesion at any level within the spinal cord or cauda equina. It appears earlier and with greater efficiency in the presence of lesions between the seventh cervical and fifth thoracic levels. It does not appear in the presence of incomplete lesions of the cord, although the effect of extravesical stimuli on the initiation of urination may be quite similar in the case of either a complete or partial lesion. Extravesical stimuli are, in any event, less effective in the presence of lesions below the tenth thoracic segment. Automatic micturition may occur with remarkable regularity at intervals as long as 3 hours, but with very low efficiency, as determined by a large residual amount of urine. Lesions of the conus and cauda equina do not produce the striking viscerovisceral reflexes, such as flushing, perspiring, headache, or reverse peristalsis, as may appear in the presence of high lesions in the cord, and the appearance of such reflex phenomena in severe form, with or without massive spasm of the lower extremities, may spell the termination of efficient automatic micturition.

Cystometric examination at regular intervals will indicate when the catheter may be removed to allow the trial of automatic micturition, which indicates that a reflex response to bladder wall tension is necessary for this activity. Automatic micturition will develop only when there is no mechanical bladder neck obstruction and when the sphincter is capable of reflex relaxation. Extravesical stimuli are an aid but not a necessity to the development and maintenance of automatic micturition. Automaticity will not develop in the patient with severe bladder sepsis, multiple calculi, or a condition of severe debilitation.

Pain. In 1919, Gordon Holmes reported his observations upon the occurrence of pain in patients with spinal cord injuries, but he studied a relatively small number of patients who lived a relatively short time after their injury. Of 471 patients recently studied some were injured in civilian life, some were observed immediately after injury and followed up for a number of years, and some were studied for the first time as long as 4 and 5 years after the lesion was produced.

Of these 471 patients, 126 complained of pain so severe as to require the consideration of active steps for its relief. In 8 of these patients the cervical spinal cord was injured; in 73, the thoracic portion of the cord; and in 45, the lumbar cord and cauda equina. In general, the pain experienced by the patients could be classified as (1) root pain, (2) burning, tingling, and poorly localized pain, and (3) visceral pain, characterized by its cramping, diffuse, and vague character.

The onset of root pain usually occurred within a few days to a few weeks from the time of the injury. Only 1 of the patients with an injury of the cervical spinal cord complained of this type of pain. Twenty-eight of the 73 patients with thoracic spinal cord injuries and 38 of the 45 with lumbar cord and cauda equina injuries suffered similar pain, which was unrelieved by medication but in many cases gradually abated in severity, although it never disappeared entirely without surgical attempts directed toward its relief.

Every one of the 126 patients complained of continuous, burning, tingling pain which was diffuse, was never localized narrowly, and almost never corresponded to the peripheral distribution of a dorsal root. Segments of the body below the level of the spinal cord lesion with complete loss of sensation to the usual sensory stimuli were involved, such as both feet or both legs below the knee. The most common description was that of burning, "shooting like electricity," "tingling like that following frostbite," and a "feeling like pins and needles." Many patients described this type of pain as being more severe with the onset of cold and damp weather; in many the pain was increased when they became excited or depressed; in others it was increased by the light contact of a finger or the touch of a wisp of cotton. Movement of the body, jarring of the bed, fatigue, attempts to concentrate upon moving the toes, and smoking were all described as factors in making the pain worse.

The onset of this pain occurred immediately after injury to several months later. Holmes stated that in the cases he observed it reached its maximum upon the second or third day after its onset and began to subside toward the end of the second or third week. He knew of no patient in whom this type of pain persisted unabated beyond a month or so after injury. In general, the patients also described this burning pain as gradually increasing in severity for a time after its onset and then becoming less severe, but in many instances the pain has persisted for 4 years and in all of them constitutes a major complaint for which they intermittently seek relief. There is no question that personality is a definite dominating factor in this type of pain. The nature of the pain assumes different attributes depending upon many emotional factors. The hot, burning pain would be replaced at times by severe crushing pressure, by sensations of viselike pinching or of streams of fire running down the legs into the feet and out of the toes, or by a pain such as produced by the pressure of a knife being buried in the tissue, twisted around rapidly, and finally withdrawn all at the same time. Many of the less well adjusted patients related this pain to the existing or healed bed sores from which the burning seemed to originate. In many respects, this pain resembles that complained of in phantom limbs, particularly with regard to its peripheral projection.

The type of pain that is classed as visceral pain must be sharply differentiated from the root pains and the diffuse, burning, unlocalizable, painful sensations just described. It is a sensation of fullness in the abdomen related directly to distention of the urinary bladder, with cramping, vague, diffuse, periumbilical, and hypogastric pains which occur when the patients receive enemas and the fluid is injected rather high, and the bowel is distended. In these patients the painful sensations continued until the bowel or bladder was completely evacuated. Many of the patients had a feeling of nausea, sudden profuse sweating, flushing of the face, headaches, and pilomotor erections. In fact, in many patients a headache and flushing of the face and neck constituted the only warning that the bladder was full and was about to evacuate automatically. These visceral sensations of pain occurred in more than 80 per cent of all the patients regardless of the level of the spinal cord injury, but they were presented by the patient as complaints for which he wished relief in only 6 cases of thoracic cord lesions.

Cordotomies were performed on 18 patients for the relief of pain; 23 operations were performed, and 1 patient had 3 operations. Only 1 patient received lasting relief from the burning diffuse pain following cordotomy; 2 received relief for 1 and 2 weeks, respectively, after which the pain returned exactly as it was before operation. Four patients received complete relief from severe root pains, and 13 had no relief from root pains following the operation. These operations were performed in Army general hospitals and in the majority of instances by inexperienced and unqualified neurological surgeons. In 6 of the patients who had lesions of the cauda equina and

who had no relief from the cordotomy, the sensory level and motor loss were at a higher dermatome level following the operative procedure, with a greater loss of automatic bladder function than had previously existed.

In 2 patients with cauda equina lesions who had both root pains and diffuse, burning pain in their legs, paravertebral alcohol injections of the lumbar sympathetic trunk had been made. In 1, temporary relief of the root pains for 3 days was obtained, but in neither patient was there relief from the burning pain.

Thirty patients who complained bitterly of burning, diffuse pain were given intravenous injections of tetraethyl ammonium chloride to determine what effect this strong vasodilator drug might have upon their pain. In all of them, coldness of the lips, dizziness, slight nausea, and weakness occurred, but there was not a uniform striking drop in the systemic blood pressure and in none of them was there any significant relief from the pain.

The clinical course of each of these patients was characterized by the administration of all types of sedatives, and in some it has been necessary to relieve the patient of narcotic addiction. There was no drug or combination of drugs which afforded them any more relief from the burning pain than did an occasional capsule of aspirin, phenacetin, and caffeine. It must be emphasized that more than 90 per cent of the total number of patients complained at some time following their injury of the diffuse, burning pains that have been described but, with the exception of this series of 126 patients, the pain either disappeared entirely and without any specific treatment, or the patient became completely adjusted to its presence and was aware of it only after an emotional upset or for some minutes immediately before he fell asleep.

Reflex activity. The loose employment of the terms, "mass reflex," "spasm," "paraplegia in extension," "paraplegia in flexion," and "spinal shock" leads to confusion in any discussion of one of the most serious problems which must be faced in the care of the patient with a spinal cord injury. These conditions are all manifestations of the same general state of altered spinal reflex activity. It is difficult, probably unnecessary, and not even desirable, to categorize all the variants of these alterations. An understanding of the nature and cause of bizarre reflex activity in man after spinal cord injury must come from a study of man.

The large number of patients with spinal cord lesions who have survived long periods following their injuries, because of the excellent care they received in comparison with World War I, has made it possible to observe and study the reflex activities which are present and when they made their onset; also their character and their relation to the general physical state of the patient.[1] Abnormal reflex activity, appearing early or late, may manifest itself in the responses to plantar or other superficial stimulation, to muscle stretching, to genital stimulation, and to the stimulation of either the bladder or bowel. The vasomotor, pilomotor, and sudomotor responses which accompany the various striated muscle contractions may be entirely erratic. Certainly, the patterns of reflex responses in these individuals are rarely repeated often enough to make them reliable for diagnostic or prognostic use.

It is commonly stated that after a severe injury to the spinal cord the condition of "spinal shock" ensues (in man for 3 or 4 weeks), during which time reflex activity is absent. The term "spinal shock" is an unfortunate one. After the first few hours are past, the truly shocking effects of the trauma have worn off, and the patient has had the customary supportive care (including surgery if that is necessary), the patient is usually comfortable, shows satisfactory blood pressure, pulse, respiration, and temperature readings, and is normally active above the level of the lesion. The exception, of course, is the midcervical or high cervical lesion which so commonly results in early death. It is hardly tenable, furthermore, that shock can be said to persist for weeks at a time with the patient in good condition save for his paralysis. This interval should be designated as one of *decreased reflex activity.* However, all reflex activity is rarely gone. In fact, the genital reflexes (active ischiocavernosus and bulbocavernosus muscle reflexes with erection) may appear immediately to be persistent over a long period of time. Erections occurring immediately have been noted in patients with transected or incompletely crushed cords, both in the cervical and thoracic regions, and this reflex has been seen to remain active and easily provoked for as long as 4 years after injury. Indeed it is through stimulation of the external genitalia (but not with nocuous stimuli), the perineal skin, and the inner surfaces of the thighs that one may first note the onset of the second stage, or the state of *heightened reflex activity.*

[1] Four hundred ninety patients have been observed and studied in civilian practice in Army general hospitals and in a Veterans Administration facility. Some of the patients were taken care of immediately after their injury and followed up through their entire course; others were taken care of immediately and later followed up in Veterans Administration hospitals. Still others were seen for the first time in the latter hospitals as long as 5 years after their original injury was received.

With the beginning of this second phase, there appear the early visceral and vasomotor reflex changes, and flexion, extension, or adduction of parts of the lower extremities. After the first day or two, there is frequently, although not characteristically, an almost normal appearing flexor movement of the toes on plantar stimulation. During this period there is retention of urine and catheter care is necessary. The bowels require enemas, but ordinarily automaticity of the bowels, if it develops at all, will begin at an earlier date than similar function of the bladder. Knee and ankle jerks are absent during the early days after injury. Bladder irrigation and enemas seldom cause flushing, sweating, headache, or "crampiness" in the abdomen before the fourth week has passed. The skin below the level of the lesion becomes quite dry, pale, and lifeless, especially on the feet and ankles, and tissue turgor is poor. It is during these first few weeks when vasomotor stability is lost in the skin that bed sores are most likely to develop.

Except for the ever present specter of decubitus ulcers, the patient is usually a nursing problem of ordinary degree during the period of depressed reflex activity, taking into account the special attentions to the bladder, the skin, and the state of nutrition. Neurological recovery, if it is to occur, will show some signs fairly early, and the persistence of depressed reflex activity, with or without any plantar responses, usually means that a complete physiological, if not anatomical, lesion exists. Sherrington discussed the period of "shock" in a few paragraphs, hardly improved upon to this date, when he stated, "Spinal shock appears to take effect in the aboral direction only. Section behind the brachial enlargement disturbs little if at all the reactions of the fore limb, although the number of headward running channels of conduction ruptured by such a section is enormous. . . . On the aboral side of the transection depression is profound. . . . The view of Goltz and his school that 'spinal shock' is a longlasting inhibition due to irritation by *trauma* is not, I think, really tenable. . . . Were the mere irritative actions of the trauma the cause, it is not easy to see why the nervous centers near the trauma should not be depressed on either side of, for instance, a spinal transection, headward as well as backward. . . . There remains the further question as to whether spinal 'shock' is a phenomenon of inhibition. . . . The condition of the spinal reflex-arcs in spinal shock appears to resemble a general fatigue rather than an inhibition. It renders difficult and uncertain the process of conduction along the reflex-arc as judged by the discharge from the terminal neurone. This suggests a loosening of nexus between the links of the neurone-chain composing the arc; a defect of transmission at the synapse. . . . I think, therefore, that spinal shock is neither due to irritation by trauma, nor in the main a phenomenon of inhibition. The rupture of certain aborally conducting paths appears to induce it."

The genital reflexes and the occasional flexion of the toes on plantar stimulation, particularly with nocuous stimuli, occurred in patients as early and as actively regardless of whether or not the cord was completely transected or severely crushed, or whether any other form of trauma was the cause of interruption of normal physiological function. Furthermore, the profoundness of the absence of other forms of reflex activity will be found to be the same when there is complete physiological (with or without complete anatomical) interruption of the cord. The problem which remains unanswered, therefore, is the cause of this sudden and persistent state of depressed reflex activity, increasingly profound as one ascends the phylogenetic scale.

Riddoch apparently also accepted the theory that separation of the effector mechanism from cerebral control was the cause of the altered posttraumatic reflexes. It seems to us, however, that if the conditions of altered reflex activity were due solely to loss of cerebral direction because of neuronal interruption, the state of change should remain the same from the time of injury, since the interruption, once effected, is final. It would seem more logical that at least one factor in the appearance of these reflex states would be a change, in the intact and adequately vascularized segment of cord and its peripheral nerve and end organs below the level of the lesion, of a histological and chemical nature. If that were true, it is possible that during the state of depressed reflex activity the various parts of the reflex-arc, including the myoneural junctions, are inactive in a period of reorientation and reorganization of function and in a state of autonomous function of a primitive nature. In this state of autonomy, however, the organs most affected, the muscles, do not atrophy apparently because of the viable cord, even though connection with the upper motor neuron is lost.

It is unfortunate that in neither animals nor man can the complete anatomical and complete physiological lesion be differentiated early. By far the greater number of patients with early complete loss of all neurological function but without gross anatomical section of the cord remain as profoundly and persistently lacking in return of function as do those known to have had the cord actually severed. There is little difference in the

deep tendon reflexes, plantar responses, muscle spasms, and genital and viscerovisceral reactions in patients with clean anatomical cord section and in those with crush, preservation of continuity of the cord, but permanent failure of neurological recovery. Gross anatomical section assures the physiologically complete lesion, but a severely contused cord undergoes such softening, with later gliosis, that it, too, is in a microscopic sense anatomically severed.

Be the injury cervical or thoracic, or open or closed, with a complete lesion of the cord as indicated either by surgical verification or by the long persistent failure of recovery, the *severity* of the heightened reflexes varies from patient to patient. There are those patients who never at any time develop anything more than the mildest degree of spasm, while others early and rapidly progress to such a condition of hyperactive reflexes that the persistent deformity calls for specific medical or surgical care. It has been observed that the early care of the patient has much to do with his later period of heightened reflex activity. When the proper surgical care has been given early, and all supportive measures, such as early ambulation of the patient, physical therapy, proper care of the bladder, the avoidance of decubiti, and other sources of sepsis and general debilitation have been attained, patients have been spared later excessive reflex activity and all the attendant ills. The greatest single factor that is under the control of those who care for such patients in securing a smooth convalescent course is the avoidance of sepsis, especially that which arises from the urinary bladder. Spasm has been greatest in the patients injured in a theater of war, whose early care was often incomplete or in whom a state of sepsis and malnutrition was established. Invariably, patients ideally cared for in civilian life have not been found to develop such severe and disabling reflex activity. The incomplete lesion, as would be expected, produces less severe spasm according to the degree of neurological loss.

The *date of onset* of the phase of heightened reflex activity is not affected by the severity of the lesion, its completeness, or whether it is in a patient with a closed or open wound of the cord. Many patients have been observed with incomplete lesions, whether verified surgically or by the results of neurological examination and continued observation, who developed increased reflex activity as soon as patients with complete lesions. However, in many patients with incomplete lesions recovery will manifest itself within a few hours or days, and with the appearance of neurological recovery the state of "shock" must be said to have terminated. Few incomplete lesions show symmetrical bilateral loss, and therefore the resultant state of hyperactive reflexes is seldom the same in the lower extremities. The patient with a completely severed or a hopelessly crushed cord will usually develop the state of heightened reflex activity no sooner or later than the patient with the contused cord which never shows any neurological function later. The date of surgical treatment, if given and regardless of its type, has not been found to affect the date of onset of the heightened reflexes. Patients have been seen with essentially an immediate onset of hyperactive, bizarre reflexes who never exhibited a period of decreased reflex activity for more than a few hours. The date of onset of heightened reflexes varies widely. It occurred in 1 patient with a complete lesion of the cord at the sixth cervical segment at the end of a full year, and in a patient with a complete lesion at the eighth thoracic segment at the end of 23 months. The average time of onset of the state of heightened reflexes was 1.5 months in the group of cervical injuries, and 2.5 months in the group of thoracic injuries. Small signs of beginning reflex activity, such as the upgoing great toe or beginning flexion withdrawal of the limb may be manifest in a feeble manner for several days, so that the transition from the state of depressed to heightened reflexes is not an abrupt one.

Many different factors affect the *nature of the reflex response.* In patients known to have partial loss of cord function the reflex patterns are most commonly extensor in type and at all times are less violent in nature. The stimulus applied, however, need be no stronger to produce a response in such a patient than in a patient with a complete lesion. In complete anatomical severance of the cord or in those patients with severe crush and persistent lack of neurological change, the reflex pattern is usually one of flexion, or flexion with adduction. Variations are many and even in a patient with complete transection of the cord well above the lower end of the cord, the response is seldom of exactly the same pattern or sequence in the two lower extremities. In its most violent form the abdominal muscles contract (when the lesion is sufficiently high), the thighs adduct, and the foot rises dorsalward, all together with flexion at the knees and hips. Several patients have developed, at some time in their hospitalization, contractions severe enough to dislocate the femur on one or both sides. One patient with an incomplete lesion at the tenth thoracic segment had extensor spasm when up walking in braces (effect of posture), but flexion-adduction of a severe degree when lying in bed and making no voluntary effort.

Ordinarily, the stronger the stimulus the more prompt and violent will be the response. Furthermore, repetitive small stimuli may, in summation, become great enough to evoke a response, a fact known to all students in the physiology laboratory. The point of stimulation is an important factor, for while on theoretical grounds the reflex appears segmentally according to the level of the stimulation, actually it is not quite that accurate. Midline stimulation, as on the skin of the pubis, genitalia, or perineum, will customarily evoke a bilateral flexor-adductor response of the lower extremities, at least as low as the knees, but plantar stimulation on one side almost invariably produces a more prompt and violent reaction on the ipsilateral side. Painful stimuli will more promptly evoke reflex activity of the lower extremity than any other form of stimulation.

Riddoch frequently mentioned the fact that many stimuli of an innocuous nature produce penile erection, often with the ejaculation of semen. It has been observed, in confirmation, that priapism may appear immediately after injury, particularly when the lesion lies above the sixth thoracic segment, and may persist throughout the period of "shock" and for months and years afterward, without decrease in the excitability of the ischiocavernosus and bulbocavernosus muscles. In the early days following injury the priapism comes and goes apparently independent of any applied stimulus, as if it were a part of the general state of vasomotor instability. Later, during the stage of heightened reflex activity, washing or stroking of the lower extremities, passing a catheter, bathing the genitalia, or turning the patient upon his abdomen may bring on the erection. In the patient with easily evoked flexor responses, a strong pricking of the soles may produce what Riddoch called the "coitus reflex" with contraction of the abdominal muscles, extension of the lower extremities, and erection of the penis. It has been observed that characteristically during this reflexly induced erection the cremaster muscles contract with elevation of the testicles and the muscles of the bulb may be felt to contract. However, the glans and corpus spongiosum never have been found to become as turgid or to persist in an erect condition so long as do the corpora cavernosa, and the penis seems more ballooned up by a sudden influx of blood rather than actually erect in the usual sense. The emission of semen has never been observed and upon extensive questioning it is the exceptional patient who has seen that phenomenon. Occasionally semenlike material in small quantity may be seen at the meatus around the catheter, or the patient may report he has seen a quantity of white ropey material in the freshly passed urine. The few patients admitting masturbation report the failure of any seminal emission. Nocuous stimuli to the erect penis produces a prompt return of the organ to the flaccid state.

It is commonly stated that perspiration does not occur below the level of a complete lesion. On the contrary, with lesions as high as the fourth thoracic segment, such profuse, dripping perspiration over the buttocks and thighs as to be a threat to the development of macerated skin and decubiti has been seen. These same facts were described in detail by Head and Riddoch. It has been observed, especially in the upper thoracic lesions, that a full bladder, just before its automatic evacuation, or a bowel distended by an enema, may produce an extensive flush of the body above the lesion, headache, perhaps nausea, "gooseflesh" on the skin of the lower extremities, and, finally, on evacuation, a return to normal color of the skin of the face, neck, and arms, with the sudden appearance of beads of sweat over the thighs and trunk. Rarely with a lesion at any level have the ankles or feet shown more than a minimal amount of perspiration. In many patients these same visceral responses may follow strong stimuli that produce flexor activity, such as pricking of the soles of the feet. After the first 8 or 10 days, during which the bowels are usually constipated, manipulations of the lower extremities, bathing the patient, or changing his position may result in the sudden evacuation of the bowels. As the months wear on, however, the bowels develop a tendency to either spontaneous evacuation or evacuation after enemas or digital stimulation of the rectum, but, in any case, with a decreasing tendency to take part in the generally heightened reflexes. The visceral reflexes tire easily, more readily than those of the striated muscles, but they are equally sensitive in the resting patient. Given a patient who has been lying quietly in bed without even the stimulation of covers touching his exposed skin, the slightest touch on the thigh or groin may cause a spurt of urine, whereas a series of such minimal stimuli are usually necessary to evoke a notable response of the muscles of the lower extremities.

Every one of 372 patients with spinal cord injury had, during some period of his record, some degree of spasm in the lower extremities following the first few days or weeks of decreased reflex activity. By no means was the spasm of such degree to cause the patient concern or require treatment in all of the patients

In the vast majority of these patients adequate nursing care, well directed physical therapy, and the maintenance of the general physical well being

of the patient (especially by the avoidance of a septic bladder and bed sores) have kept the patients comfortable and allowed them to be sufficiently mobile to permit some mechanical aid to ambulation, such as a wheel chair, crutches, or braces.

The treatment of the patients whose condition demanded relief of the spasm has been either medical or surgical, or, in some instances, both. In general, the use of the common sedatives, such as bromides, has not affected the hyperactive reflexes. Curare in its various forms has been used on a considerable number of patients but as yet a prolonged effect and the avoidance of undesirable side effects have not been attained. Posterior rhizotomy, as well as the intrathecal injection of alcohol, has been used in isolated instances without effect. In the patients treated by posterior rhizotomy, no untoward effects on the skin of the affected segments have been noticed. Anterior rhizotomy as high as the tenth thoracic segment, inclusive, has been uniformly successful when applied over a sufficiently great enough number of segments, but the operation should be studiously avoided until it has been established beyond all doubt in the patient's mind that the lesion is complete. It is not always easy to isolate the anterior from the posterior roots at operation, nor is it always a simple matter accurately to identify the segments. This is true especially when the injury is at the spinal levels of the eleventh or twelfth thoracic, or the first lumbar segment.

Scarff and Pool have proposed the theory that the so-called mass reflexes and severe muscle spasms are influenced by scar tissue at the site of the lesion on the end of the distal cord segment. They believe that this cicatrix heightens the irritability of the isolated segment of cord, and that removal of the cicatrix, excision of all local degenerated tissue, and surgical section of the dorsal columns in the upper portion of the lower cord segment helps to allay or completely remove this condition. In 2 patients the scarred proximal and distal ends of the severed cord were freshly resected with the local removal of all irritating factors, such as abnormal vascular ingrowths, bone fragments, ligamentous cicatrix, and callus, but without prolonged or noticeable effect.

Some patients who suffered predominately from adductor spasm, and in whom the tendency for the lower extremities to cross has been a real impediment to their otherwise possible ambulation, have had immediate relief with improvement in their use of canes, crutches, or braces following the bilateral section of the obturator nerve, as approached through the lateral reaches of the space of Retzius. Walking is not interfered with by this procedure, which has been performed in 22 patients. There is a smaller group of patients who, after months of deformity due to severe flexor-adductor spasm, are not relieved by anterior or posterior rhizotomy because of tendon contractures. These patients should be treated by tenotomy at the involved joints.

The very facts that certain patients develop extremely little "spasm," that some develop spasm very early and others very late, that some show extensor and other flexor responses with the same type of lesion, that the viscerovisceral reflexes are very marked in some patients, and that in some patients the spasm may spontaneously become greatly abated, as well as the fact that in the majority of patients sepsis definitely increases the severity of spasm, indicate that the adaptability of the isolated cord and its attached peripheral mechanisms to its new independence varies in patient to patient, and that this adaptability, as indicated in the variety of responses, is a matter of intrinsic change, anatomical or chemical, or both, within the various parts of the arc. It is toward a knowledge of these changes that our attentions should be directed, rather than solely to the observation and recording of the dramatic neurological changes demonstrated by physical examination.

RUPTURED NUCLEUS PULPOSUS

Some orthopedic surgeons still deny vehemently that there is such a pathological lesion as rupture of the nucleus pulposus through the annulus fibrosis with impingement upon and irritation of the nerve root. There are also those surgeons who believe that every pain in the back which radiates down the leg is due to such a lesion and, in fact, attribute these symptoms to "concealed discs." As is usually the case the truth lies in the middle ground.

In the European Theater of Operations of the United States Army, the policy was adopted that a patient with severe back distress and radiation of pain down an extremity along the course of the sciatic nerve should be treated conservatively by bed rest and other measures directed by the bone and joint surgeons. If these failed to give him relief and if he showed a postural defect, spasm of the sacrospinalis muscles, impairment of the active and passive straight leg raising movement, subjective and objective sensory disturbances in the distribution of the affected root, absence of the Achilles reflex, and a positive defect upon myelography, an operation for the removal of a ruptured nucleus pulposus was to be performed. It

was decided to keep separate the indications for removal of a ruptured nucleus pulposus and those for fusion of the lumbosacral spinal column. This policy has been found to be a very satisfactory one at a Veterans Administration hospital and in private civilian practice.

The results of these operations in military practice were on the whole quite unsatisfactory, but there were many complicating factors which influenced the result. If, after this operation, intensive and persistent physical rehabilitation exercises designed to strengthen the back muscles are insisted upon and carried out faithfully by the patient, the results will prove excellent as judged on the basis of a successful return to the former social and economic position. Removal of a ruptured nucleus pulposus will cure sciatic pain, but it will not cure a spinal column which needs a fusion operation.

PERIPHERAL NERVE INJURIES

The most significant advances in our knowledge of peripheral nerve injuries during World War I were made in the fields of diagnosis and physiology. There were a considerable number of British neurologists, physiologists, and surgeons, but only a few Americans, who made valuable contributions.

Unfortunately, the records of the studies made and the operations performed upon the patients with such injuries in the U. S. Army were completely lost, as far as any organized effort to follow the results was concerned. It was a bitter disappointment to the American neurologists and surgeons interested in peripheral nerve injuries and their British colleagues when the centers established immediately after the war for continued study of these patients failed to attain their objectives.

An effort was made in World War II to avoid the repetition of such wasted opportunities. A peripheral nerve registry was established by the Surgeon General's office and now, following the war, the Veterans Administration has allocated funds for follow-up examinations and studies upon the patients. However, a completely organized and well directed plan for accomplishing the best possible care of the patient and, at the same time, obtaining data which would answer many of the challenging questions that existed was never properly formulated and effected from the beginning. Certainly, anyone who had the opportunity of seeing the co-ordinated efforts in the care of peripheral nerve injuries at the Wingfield-Morris Hospital at Oxford, under Seddon, cannot have a great deal of hope for what may eventually come from our belated, complicated, confused, and incomplete efforts.

Early in the course of the War, a great amount of energy and time was wasted by many of the younger group of neurological surgeons in proving to themselves that the work of Huber and his associates upon peripheral nerve problems during World War I was correct. There was a considerable preoccupation with mechanical matters, such as wrapping tantalum foil around a suture line, which effectively blocked its vascularization; using metallic tension sutures through the trunk of a nerve so that separation of the nerve ends might be followed roentgenographically; and attempting to find a suture material superior to fine silk. While some few operations performed made use of nerve grafts, the results were recorded long before one could possibly hope for regeneration through the transplant to occur and the use of homogenous grafts was damned. Yet, the answer to this question must come from the human being because in experimental animals microscopic proof of recovery with function by means of homogenous grafts has been obtained. The opportunity was presented in the Army general hospitals which were both amputation and neurosurgical centers. Fresh homogenous grafts could be obtained and immediately transplanted into patients with continuity defects which could be bridged in no other way. Granting that the grafts might fail, the patient had nothing to lose and everything to gain. So, we must continue to gather material slowly and laboriously from civilian cases in which transplants may be indicated, and they multiply slowly. The few cases in civilian life in which fresh homogenous nerve grafts have been employed have proved that they do not disappear by lysis, and in several instances the electrodiagnostic and clinical symptoms of regeneration are sufficiently encouraging to demand a careful assessment of the problem in the human being on a statistically significant number of patients.

A considerable amount of experimental research on peripheral nerve problems was planned and implemented through the Office of Scientific Research and Development and the National Research Council during World War II. Tarlov's work upon the use of plasma glue for the union of nerve ends which could be approximated without tension, the effect of the sulfonamides locally on nerve regeneration, the traumatic degeneration produced by the concussive effect of gunshot wounds which did not sever the nerve trunk, (different as it is from Wallerian degeneration), the demonstration of new staining methods (other than the old accepted silver stains) of the

different patterns of nerve regeneration in end-to-end sutures and autogenous and homogenous grafts, and the electrodiagnostic and electromyographic methods elaborated for the study of denervated and reinnervated muscles were among these projects.

Following animal experiments and studies carried out upon patients in an Army general hospital, Pollock and his associates emphasized the fact that faradic stimulation is effective throughout degeneration, denervation, and regeneration, provided that sufficient amperage is employed. The changes of response to galvanic stimulation of "infinite time" which characterize the complete reaction of degeneration are (1) hyperirritability of the muscle to galvanic stimuli, (2) sluggishness of the relaxation of the contraction wave, (3) lessening of the ratio between the amperage necessary to produce tetanus and the rheobasis to almost unity, and (4) increase of the efficacy of the anodal closing stimulus to equality with the cathodal closing stimulus. These workers also stated that the unequivocal signs of recovery are (1) a sudden increase in the rheobasis, (2) an increase of the ratio between the amperage necessary to produce tetanus and the rheobasis, and (3) an increase in the efficacy of the cathodal closing stimulus as compared with the anodal closing stimulus. A very high ratio or a very high threshold amperage is indicative of regeneration, and these electrical signs of recovery antedate the recovery of motion and sensation by many weeks.

The practical application of these electrodiagnostic methods can hardly be overemphasized. When a sufficient time after injury has elapsed to permit the development of the state of denervation and the characteristics of denervation are not found by electrodiagnosis, the nerve is spontaneously recovering and should not be operated upon. If, after a severed nerve is sutured, the characteristics of the denervated state are not found, it may be assumed with certainty that recovery is taking place. When a sufficient time has elapsed following nerve injury for regeneration to have occurred and the characteristics of denervation are found, then the nerve must be operated upon.

The question of how nerve fibers regenerate after division has been the subject of innumerable contributions beginning with Howell and Huber in 1892 and Ranson in 1912. The use of the silver staining technique precluded a simultaneous study of the nerve fibers, endoneurium, the Schwann cells, the perineurium, the epineurium, and the capillaries. This became possible when nerve sections were stained with silver and counterstained with fuchsin. The mesodermal tissue is the first to react following any nerve injury by proliferating. This proliferation takes place at the site of the lesion and from there on into the gap between the severed nerve segments, in the degenerated distal nerve segment, and in the perineurium and the epineurium of the central as well as the distal nerve segment. Regenerating nerve fibers follow the path of proliferating histiocytes and collagenous fibers. Wherever this proliferative mesodermal reaction takes place, regenerating nerve fibers may be seen following the course of the mesodermal fibers, even deviating into the epineurium of the distal segment or, as retrograde fibers, into the epineurium of the central segment, or invading the surrounding muscles. This observation appears to be evidence against the generally accepted theory that the regenerating distal segment of a cut nerve exerts a chemotropic influence on regenerating nerve fibers growing out of the end of the central segment.

The mesodermal tissue plays a primary role in the organization of autogenous and homogenous grafts in laying down a scaffolding which is followed by the regenerating nerve fibers. Depending upon the degree of survival of the mesodermal elements in the graft and the degree of necrosis which took place, this scaffolding follows the original nerve structure or becomes irregular, deviating, and confused in its course, and thus influences the course and the efficacy of the regenerating nerve fibers.

A very definite contusion effect within the nerve may be found following gunshot injuries which do not interrupt the continuity of the nerve. Extensive traumatic damage is present for a long distance centrally and peripherally from the site of trauma. It leads to a process of necrobiosis and dissolution of the ectodermal elements with survival of the mesodermal elements, and results in an obliteration of the endoneural structure and a marked confusion in the course of the regenerating mesodermal and nerve fibers.

Young and Medawar in England and Tarlov in this country carried out a series of experiments, using concentrated blood plasma gel as a method of uniting divided nerve ends. There is no doubt that this method can be used to advantage in experimental nerve sections and in the human being when the nerve ends can be approximated easily. The microscopic evidence of the advantages of plasma gel over other suture material is quite definite, and it remains to compare a considerable series of operations upon animals, using plasma and fine silk suture material, both microscopically and for the return of function in the denervated muscles. Plasma gel has a definite place as a

suture material when nerve transplants are employed, particularly in the smaller nerve trunks such as the digital nerves.

There were many cases of causalgia observed among patients with peripheral nerve injuries in World War II. There is some confusion as to what constitutes this condition mainly because the classic description first made by S. Weir Mitchell was not adhered to strictly. There are some who believe that causalgia, Sudeck's atrophy, painful osteoporosis, and other so-called "minor causalgias," or painful "phantom limb" are different clinical manifestations of the same underlying disorder. Mayfield and Devine presented the most accurate and careful study of cases of causalgia which they encountered. They correlated the symptoms and trophic changes with the blood flow in the extremity affected, and the results of their studies suggest that the pain of causalgia does not result from alteration in the blood flow, because some patients were found in whom the injured extremity was in a state of vasodilatation, while others showed vasoconstriction. Sympathectomy gave prompt relief regardless of the state of the blood vessels, a fact which is somewhat difficult of explanation.

Seddon called attention to the severity of the injury to a peripheral nerve from traction without disruption of the anatomical continuity of the nerve trunk. For example, the peroneal nerve may be stretched tightly across the head of the fibula. He pointed out that patients with this condition showed evidence of severe damage by a delayed return of function or no return whatever. This type of injury to the elements of the nerve trunk is similar to the effects of concussion from a high velocity bullet passing near a nerve trunk without interrupting its anatomical continuity. The difference between this type of traumatic degeneration and true wallerian degeneration has been described and emphasized by Hiller and his colleagues.

The question of the opportune time to operate upon peripheral nerve injuries was widely discussed during World War II, mainly because Seddon stated that an interval should elapse between the receipt of the injury and repair of the divided nerve trunk. With this all inclusive viewpoint, American neurological surgeons, who had had experience with operations upon peripheral nerve injuries and long continued follow up studies upon the results, would not agree. Certainly, a patient who receives a laceration of the wrist with division of the flexor tendons and the ulnar or median nerves by thrusting his hand through a window glass, should be operated upon as quickly as possible after the injury, and the tendons and nerves should be promptly repaired. If the same injury has resulted from an accident by which the wound was severely contaminated, and if the surgeon first encounters the patient from 12 to 24 hours later, the chances for the development of infection are serious, although infection might well be avoided by meticulous cleansing of the wound and the use of chemotherapy. But again, the tendons and nerve ends should be repaired immediately. If infection develops the nerve ends are approximated, and the amount of neuromatous tissue to be resected later will be less and traction of the nerve ends will be prevented. If, however, there was destruction of a nerve trunk with a large gap in continuity which can not be bridged by the usual methods of obtaining end-to-end apposition, then repair may be deliberately delayed. Certainly, repair should be delayed if the wound is grossly contaminated and infection is highly probable, regardless of whether or not the ends can be approximated by movements of the adjacent joints.

It was shown experimentally that trophic ulcers developed invariably when nerve ends were allowed to remain separated, but when the ends were approximated, even when it was accomplished by nerve transplants, ulcers did not occur. The amount of atrophy which developed in the muscles was certainly less in the experimental animals under the same conditions. Clinically, there is no doubt that the best results have been obtained, regardless of the nerve involved, when the nerve ends have been apposed as early as possible after the injury.

It has been shown experimentally that if a denervated muscle can be stimulated electrically rather constantly, atrophy can be prevented. In the human patient this is difficult of proof, but it has been generally accepted that electrical stimulation to the denervated muscles, plus intensive massage, active and passive movements, and proper splinting improve recovery of the patient considerably.

COMMENT

Neurological surgery is a specialty of surgery. A background of fundamental knowledge of neurology is a prime requisite, and to a lesser degree ophthalmology and roentgenology. Good training in the basic sciences is necessary for every good surgeon, whose aim should be to restore his patient as nearly as possible to the physiological normal. There is no reason to assume that the neurological surgeon is an expert neurologist. Certainly, the surgeon would not agree that the

neurologist can, without proper training and persistent effort, be an expert surgeon. There should and must be a co-ordination of efforts, a meeting of minds, and exchange of ideas directed toward giving the patient the best possible care and advancing the possibilities of treatment for the neurological diseases. The contributions which each individual can make in his chosen field of endeavor must be recognized and utilized for the common goal. The neurological surgeon must not be diverted from that goal by gadgets and surgical stunts. Preparation for wars must include the medical profession which has given more to the military services than any one other professional class in the past. We must not again allow 1,500 military medical men, out of touch and disinterested in the progress of medicine, to agree in principle and obstruct in practice the objectives of the civilian profession in the care of the wounded.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYE

Proptosis Due to Neuroblastoma of the Adrenal Cortex (Hutchinson's Syndrome): Report of a Case.
RONALD A. COX. *Arch. Ophth.*, Chic., 1948, 39: 731.

A male child 15 months old revealed on first examination a proptosis of the left eye, enlarged glands at the angles of the jaw, a mass in the upper left quadrant of the abdomen, and a striking anemia (hemoglobin concentration, 56 per cent). The roentgenogram showed extensive destruction in the left ethmoid, sphenoid, and frontal bones, and radiolucent areas in the upper end of each femur and humerus. The patient became increasingly lethargic, and death occurred 40 days after admission. The diagnosis of neuroblastoma of the left adrenal cortex was confirmed at autopsy.

In neuroblastoma of the adrenal cortex the orbit is always involved, and frequently the eye gives the first indication of the disease. Invariably a fatal termination follows in from 2 to 5 months. Only 291 cases have been previously reported. The average age for the Hutchinson type is 3 years, 10 months.

Tumors composed of undifferentiated neural cells, such as neuroblastoma, are highly malignant, while tumors from differentiated neural cells (ganglioneuroma, paraganglioma, pheochromocytoma) are benign. In the Pepper syndrome, the neuroblastoma predominantly involves the mesenteric lymph nodes and liver; in the Hutchinson type, the skull and periorbital area are particularly affected.

The diagnosis is probable in young male children when pain in the bone, bulging of the eyeball, an abdominal mass, and anemia are present. To be differentiated are lymphatic leucemia, lymphosarcoma, chloroma, Hand-Schüller-Christian disease, and Ewing's sarcoma. Thus far, no treatment has proved effective. Surgical intervention is usually followed by death within a short period.

JAMES E. LEBENSOHN, M.D.

Allergic Conditions of the Eye. Keratitis Rosacea.
VERA B. WALKER. *Brit. J. Ophth.*, 1948, 32: 759.

The term "allergy," as applied by the author, denotes an altered reaction rather than a hypersensitivity. Most allergic conditions are acute in onset and, if recognized and treated at once, clear up quickly, often within a few minutes or hours, leaving no permanent damage to the tissues involved; but it must be realized that once a tissue has remained in an abnormal physiological condition for some time, as in recurrent keratitis or iridocyclitis, there are secondary changes due either to inflammation or infection, which must be healed by routine treatment, although the allergist may be able to help in preventing a recurrence of the lesions. It is not known why one tissue rather than another should be the "shock" tissue in any patient, and we are left wondering whether some damage, possibly congenital and probably traumatic, must have been a forerunner of the condition. The presenting clinical signs and symptoms will depend upon the underlying structures of the various tissues involved. Depending on which tissue is sensitized to the offending allergen, i.e., the "shock" tissue, we may see angioneurotic edema, blepharitis, conjunctivitis, keratitis, iritis, iridocyclitis, keratitis rosacea, retinal hemorrhage or detachment, choroiditis, glaucoma, cataract, or migraine.

Keratitis rosacea, a relatively common abnormality of the skin of the face of adults between the ages of 20 and 50 years, is frequently accompanied by ocular manifestations, varying in degree from a mild conjunctivitis, through all the states of blepharoconjunctivitis, episcleritis, and keratitis, to eventual visual incapacity. As numerous as are the lists of possible causes of keratitis rosacea, almost all authors agree that the condition is metabolic rather than local; digestive upsets, deficiency diseases, and hormonal disorders all play a part and must be appropriately treated; but even after all these have been corrected and all bacteria removed, there is still an underlying condition which predisposes to recurrence. From a survey of 76 cases, it is seen that allergy plays a fundamental part in the syndrome.

Local treatment consisted of (a) removal of secondary infection with penicillin ointment, sulfathiazole, or antiseptic ointments; (b) the application of dithranol (0.1 per cent dihydroxyanthranol) cream to the skin twice daily for at least 2 weeks. General treatment consisted of desensitization with specific antigens by a 6 weeks' course of injections; nonspecific desensitization of others with histamine-azo-globulin by 10 graded intramuscular injections (0.05 c.c., 0.1 c.c., 0.2 c.c., 0.3 c.c., 0.4 c.c., 0.5 c.c., 0.6 c.c., 0.7 c.c., 0.8 c.c., and 1.0 c.c.) at the rate of 2 injections a week for 5 consecutive weeks. If at a later date a recurrence of symptoms of either eye or of the face occurs, then 0.5 c.c. of histamine-azo-globulin is given immediately, and repeated after 4 days.

It appears that 70 per cent of the patients with keratitis rosacea have not had a recurrence of symptoms within the 2 years following their treatment; many of these are still symptom-free after 3, 4, or 5 years. It is significant that there is a difference between the group in which specific allergens were found, and the group in which all patients were treated with histamine. In the first group, the percentage of patients who remained symptom-free was nearly twice as great as in the second group.

The author emphasizes the urgency of referring all cases of keratitis rosacea to the allergists for investigation, as well as other cases of keratitis of unknown origin, especially in patients with a family history of acne, eczema, and urticaria, even though their own skin manifestations have not yet become obvious.

MICHEL LOUTFALLAH, M.D.

Allergic Conditions of the Eye: Migraine. VERA B. WALKER. *Brit. J. Ophth.*, 1948, 32: 764.

Migraine is of importance to ophthalmologists, first because all humans with severe headaches, from whatever cause, eventually find their way to an eye hospital to be checked for refractive errors, and second because 50 per cent of individuals with migraine have eye symptoms, often very severe in onset.

The study was made on 100 consecutive cases of migraine investigated during the period from 1943 to 1947, and 54 were proved to be allergic either by clinical trials, by skin tests or, more often, by both methods. With each patient, an attempt was made to produce a migraine attack before prophylactic treatment was begun. Typical examples of such patients' histories were given and, when the allergy was confirmed by clinical trial, the treatment consisted in avoidance of contact with the offending allergen, or desensitization.

While these cases show that if a patient has allergic migraine he can be helped tremendously by avoiding those allergens to which he is specifically sensitive, or by being desensitized, it must be remembered that the other 46 per cent of patients should be excluded from these somewhat tedious investigations as they can derive no benefit from them; they do not belong to allergic families and do not present other manifestations of allergy themselves. Realizing that all patients are reluctant to give a detailed family history or an accurate personal history, other clinical methods for separating the 54 per cent allergic from the 46 per cent nonallergic patients have been sought and, during routine general examinations, significant differences of systolic blood pressures in the two groups were observed; there was no marked difference in pulse pressures. From the study, it becomes clear that although all migraine sufferers do not have low systolic pressures and all migraines are not of allergic origin, if a patient with true migraine has a low systolic pressure, then allergy should be suspected and treated appropriately.

The author concludes that migraine in patients with low systolic pressure are manifestations of allergy.

MICHEL LOUTFALLAH, M.D.

Symposium: Corneal Transplantation. Selection of Cases. R. TOWNLEY PATON. *Am. J. Ophth.*, 1948, 31: 1365.

The author stresses that each case being considered for corneal transplantation must be evaluated individually, but he lists a few basic considerations.

Environmental factors, age, and the physical condition of the patient are carefully considered. If other more simple surgery can improve vision, corneal transplantation should be reserved.

The cases for surgery are classified as:

1. Those favorable to improvement of vision. These should present no active disease, no increased intraocular tension, and no vascularization. Vision should be less than 20/200 corrected.

2. Those partially favorable to improvement of vision. They may have some vascularization of the cornea and an opacity may be present but it should be surrounded by clear cornea.

3. Those unfavorable to improvement of vision. These would present amblyopia, marked mystagmus, corneal scars from lime, or severe burns.

4. Those amenable to cosmetic improvement, the transplantation being used to replace the old tattooing operation.

5. Those presenting descemetocele. The results in these cases are excellent if other factors are favorable.

6. Cases in which preliminary surgery or treatment is necessary.

EARL H. MERZ, M.D.

Symposium: Corneal Transplantation. Technique. JOHN M. MCLEAN. *Am. J. Ophth.*, 1948, 31: 1370.

In this report the actual surgical techniques of corneal grafting were discussed. A résumé of the history of corneal grafting showed progress from 1887 to the present time.

The various techniques then discussed were total keratoplasty, rotating autokeratoplasty, superficial lamellar keratoplasty, and partial penetrating keratoplasty. The partial penetrating keratoplasty is most successful in ordinary cases. In this operation a relatively large graft is used and held in place by sutures in the cornea but not in the graft. Either round or square grafts are used, and the anesthesia is local. The pupil is widely dilated. The postoperative care is similar to that of cataract, with dressings only every 4 to 5 days.

EARL H. MERZ, M.D.

Symposium: Corneal Transplantation. Complications. RAMON CASTROVIEJO. *Am. J. Ophth.*, 1948, 31: 1375.

The author divides the complications into several groups and discusses each group.

1. *Complications during the operation.* The corneal epithelium may be damaged on either donor or recipient. This does not interfere with surgery but increases the possibility of infection. The incision may not be centered on the cornea, or a thin cornea may be perforated when the graft is outlined. In either case one may proceed with or postpone the procedure, as desired. If the suture is broken during the operation it can be tied, but the knot must be drawn away from the graft to prevent opacification. The lens may be injured during the operation. The section should be completed and the lens material removed with as much capsule as possible. Extra suturing is needed to prevent vitreous prolapse. If the pupil is not fully dilated after section and cannot be dilated, an iridectomy is advised.

2. *Complications during the postoperative period.* The graft may be completely displaced outside of the corneal opening. Reimplantation is necessary, with added suturing if possible, or a new graft is prepared. If this is impossible a conjunctival graft is advised. If an iris prolapse occurs it is advisable to wait 3 weeks and then incise the iris and suture the graft. Prophylactic treatment should be started for infection.

Synechiae are very common and require freeing either with mydriatics, myotics, or surgery. Surgery is not attempted before the fourteenth postoperative day nor after 3 weeks. The procedure is given in detail.

3. *Infections.* Glaucoma, vascularization, inflammation, and edema are all discussed briefly and their treatment is described. EARL H. MERZ, M.D.

Symposium: Corneal Transplantation. Physiopathology. A. E. MAUMENEE and WALTER KORNBLUETH. *Am. J. Ophth.*, 1948, 31: 1384.

The first portion of this article deals with 4 separate experiments on the fate of the grafted cornea. The conclusions drawn were as follows:

1. There is no massive replacement of the cells in an autogenous or homogenous graft at any time.

2. The wandering macrophages of the recipient animal probably contribute from the beginning in a limited degree to the replacement of the donor cells in a corneal graft.

3. Viable donor cells are essential for a successful take of a transplant, at least for the first 2 weeks after operation, until the dependence of the donor graft on the recipient cornea is fully established. The donor cells are not essential to the clarity of the graft once the tissue has become firmly attached to the recipient cornea.

The second portion of the article deals with factors which influence the results of keratoplasty. The factors are divided into the condition of the grafted tissue, the status of the recipient cornea, and the operative complications.

The authors conclude that the donor cornea should be viable tissue and as untraumatized as possible. The continued viability of the graft is not essential after the second postoperative week. The recipient cornea should not be completely opaque nor edematous. Good apposition of the graft should be obtained. EARL H. MERZ, M.D.

Symposium: Corneal Transplantation. Results. W. C. OWENS, J. J. FRANK, BRENDAN LEAHEY, P. E. MESSIER, and OTHERS. *Am. J. Ophth.*, 1948, 31: 1394.

A statistical study has been made of the results of 417 corneal transplantation operations.

The graft remained clear in 36.5 per cent of the cases.

The percentage of clear grafts varied greatly with the cause of the corneal opacity. The best results were obtained in cases of keratoconus (65.2%), hereditary dystrophy (58.8%), interstitial keratitis (49.0%), and nonspecific inflammatory scars (46.9%). Poor results were obtained in cases of active keratitis or corneal ulcer (23.1%), scars from chemical burns (20.8%), trauma (18.2%) and gonococcal ulcers (8.7%). No clear grafts were obtained in cases of Fuch's dystrophy.

The larger the size of the corneal opacity and the greater the extent of corneal vascularization, the less were the chances of obtaining a clear graft.

In a group of 79 cases selected as having the most favorable prognosis, 68.3 per cent of the grafts remained clear.

Of 229 patients with preoperative vision of 20/200 or less, 36.2 per cent obtained a postoperative vision of 20/100 or better. A group of 58 patients with preoperative vision of 20/200 or less was selected as having the most favorable prognosis. Of these, 55.2 per cent obtained a postoperative vision of 20/100 or better.

The visual results after corneal transplantation in patients with preoperative vision of 20/100 or better do not warrant the risk of the operation.

EARL H. MERZ, M.D.

Anterior Flap Sclerotomy with Basal Iridencleisis; A Preliminary Report. H. B. STALLARD. *Brit. J. Ophth.*, 1948, 32: 753.

The operation proposed consists in reflecting a conjunctival flap, fashioning a scleral flap hinged on the corneoscleral junction, a limited cyclodialysis, and the inclusion of a basal tongue of iris between the lips of the sclera, leaving the sphincter pupillae intact. The operation has been performed in 29 cases of chronic glaucoma and in 2 cases of acute congestive glaucoma, with encouraging results. Iritis occurred 3 weeks after operation in one case. In this respect the postoperative course differs from that following the trephine operation in which some degree of iritis commonly occurs. The technique is as follows:

A suture is passed through the tendon of the superior rectus muscle and is clamped down in the frontal region. A subconjunctival injection is made about 3.5 mm. from the limbus from 10 to 2 o'clock so as to raise the episcleral tissues and conjunctiva. The conjunctiva is grasped by smooth forceps 2.5 mm. anterior to the insertion of the superior rectus. The conjunctiva is then snipped for about 5 mm. down to the sclera. The blades of the scissors are spread and the conjunctiva is undermined laterally on both sides. The conjunctiva and episcleral tissues are then undermined down to the limbus. One blade of the scissors is now passed underneath the conjunctiva on the temporal side and slightly downward, and the conjunctiva is cut for about 8 mm. from the midline. Similarly, another incision is made on the nasal side. The conjunctival flap thus formed is turned forward and downward over the cornea with a few strokes of a small applicator. With a double-pronged conjunctival hook, the conjunctival flap is now held downward by the assistant. With a few strokes of

the corneal splitter, a clear view of the episcleral tissue just above the limbus is obtained. Any bleeding points can be checked by a touch from a heated probe. This probe also seals off any superficial episcleral vessels in the line of the scleral incision to be made 5 mm. long, 2 mm. above and concentric with the limbus. A fine scleral hook is inserted into the sclera in the 12 o'clock meridian 2 mm. above the limbus; this steadies the eye during the scleral incision and also retracts the anterior lip of the incision. The scleral incision is made with either a sclerotome or a ground-down cataract knife vertically in the sclera. When the ciliary body shows in the incision, any remaining scleral fibers are divided by a few light strokes with the point of the cataract knife. The scleral hook in the anterior lip of the scleral incision is now slightly raised and a cyclodialysis spatula is passed through the center of the incision into the anterior end of the suprachoroidal space, then on to separate the scleral spur and to enter the anterior chamber. In the anterior chamber, the spatula is moved in turn to each side of the scleral incision so as to effect a cyclodialysis 5 mm. long. Aqueous flows out of the incision during this procedure. The cyclodialysis spatula is withdrawn. With the scleral hook still in place, one blade of the scissors is passed on the flat into one end of the scleral incision for 2 mm. The blade is then rotated so that its cutting edge faces forward, and its blunt end is level with the corneoscleral junction and 1 mm. nearer to the midline than the end of the scleral incision. The blades of the scissors are closed and a converging cut is made in the sclera down to the limbus. A similar procedure is done at the other end of the scleral incision. When this is completed, a hinged scleral flap is made, based on the limbus. A pair of iris forceps, closed, is now introduced into the center of the incision, and the iris is grasped 2.5 mm. above the pupillary margin and drawn up into the center of the scleral wound as the conjunctival flap is being drawn down by the assistant. A snip about 1.5 to 2 mm. long is made with fine blunt-ended scissors in the iris immediately in front of the forceps. One blade of the scissors is passed through the snip toward the temporal side, and a cut 3 mm. long is made toward the iris root. A blade of the scissors is then directed through the iris incision nasally toward its root, and a cut is made for about 3 mm. The folded tongue of iris based on its root is then laid on the sclera so that about 2.0 to 2.5 mm. projects above the upper lip of the scleral incision. It may be necessary, in some cases, to reposit the iris; often it is sufficient to apply the iris repositor to the upper part of the cornea and make a downward stroke over its surface.

Postoperative treatment has been simple. There is no need for digital massage; atropine is used at the first dressing and omitted thereafter. The patient is allowed up in a chair on the fourth day and is allowed to leave the hospital on the eighth day. The anterior chamber is reformed on the day after operation. Small hyphemia occurred in 6 cases without further complication.

MICHEL LOUTFALLAH, M.D.

Studies in Experimental Ocular Tuberculosis: The Effect of "Promin" and "Promizole" on Experimental Ocular Tuberculosis in the Immune-Allergic Rabbit. ALAN C. WOODS and EARL L. BURKY. *Arch. Ophth.*, Chic., 1948, 39: 471.

Promin and promizole are sulfonamide compounds which have been shown to have a deterrent action on tuberculosis in experimental animals. The present study concerns the effect of these drugs on ocular tuberculosis in immune-allergic rabbits. Rabbits were inoculated in the groin with a virulent human strain of tuberculosis which caused a definite hypersensitivity to tuberculin and a resistance to reinoculation. Inoculation of the anterior chamber of such immune-allergic animals was followed by the formation of small, hard tubercles on the iris and cornea with a moderate inflammatory action which became inactive in from 3 to 6 months. Such animals were treated with 1.5 gm. per rabbit per day of the drugs, beginning the sixth week after inoculation of the anterior chamber. After 3 months of treatment the eyes were sectioned for histologic study. In another similar group the uveal tract was removed after treatment and, after appropriate extraction, injected into the anterior chamber of normal rabbits.

The treated rabbits began to improve after 3 weeks of treatment and by the twelfth week, at which time the control eyes were markedly inflamed, the ocular tuberculosis in the treated group was almost completely inactive. Promizole and promin seemed equally effective although promin was the more toxic. Sections of the eyes indicated that the untreated animals had many more lesions which were larger and more active than the few lesions found in the treated animals. Inoculation of the uveal tract extract into the anterior chamber resulted in ocular tuberculosis in all animals injected with material from the control group. The uvea of one of the 3 rabbits treated with promin produced ocular tuberculosis upon inoculation, but only after the very long incubation period of 2 months. The uvea of rabbits treated with promizole did not produce tuberculosis on inoculation. It is concluded that both promin and promizole have a definite deterrent action on ocular tuberculosis in the immune-allergic rabbit but do not produce a complete cure. The action may be due to either a degradation or attenuation of the virulence of the organisms, allowing the reaction of the host to become more effective, or to a direct bactericidal action on the bacteria.

FRANK W. NEWELL, M.D.

Bacitracin in Ocular Infections. J. G. BELLOWS and C. J. FARMER. *Am. J. Ophth.*, 1948, 31: 1211.

Ocular tissues have a tolerance to bacitracin in concentrations up to 1,000 units per milliliter of saline solution given externally and up to 100 units

in from 0.05 to 0.1 milliliter saline solution given internally.

The corneas of the right and left eyes were injected with a bacitracin-sensitive hemolytic Staphylococcus aureus broth culture. Treatment was begun from 30 minutes to 8 hours afterward in the right eye, and the left eye was used as a control.

Undiluted broth culture was injected into the cornea of 15 rabbits and bacitracin solution (1,000 units per milliliter of saline solution) was applied to it.

Corneal infections caused by the cultures of pathogenic hemolytic Staphylococcus aureus organisms can be prevented by bacitracin, the important factors being the strength of concentration, the time interval before treatment was started, and the length of time of contact of the antibiotic with the lesion.

Bacitracin (100 u. per 0.05 ml. of saline solution) was injected into the vitreous with a minimum of damage, and since untreated purulent infection of the vitreous is certain to result in the loss of an eye, the risk was warranted.

Various strength culture broths (0.05 c.c.) were injected into the vitreous of rabbits and bacitracin in various strengths was then injected at various intervals.

There seemed to be a relationship between the strength of the culture used and the strength of the antibiotic. The results ranged from a temporary checking of the infection to a complete prevention of infection.

The close contact of the bacitracin with the organisms in the vitreous seemed to increase its effectiveness.

The cases of human ocular infections which were treated were classified as acute conjunctivitis, acute keratoconjunctivitis, acute exacerbations of chronic conjunctivitis, and chronic conjunctivitis.

In the first three the results depended on whether or not the organism was susceptible to bacitracin, but in general they were favorable. Less favorable results were obtained in the cases of chronic conjunctivitis.

Experimental infections of the cornea and vitreous by the hemolytic Staphylococcus aureus can be prevented by bacitracin. Prophylaxis for the vitreous requires a longer time than prophylaxis for the cornea.

Clinically, bacitracin showed more favorable results in acute phases of external eye infections than in chronic infections. It was effective in certain cases in which the sulfonamide and penicillin had failed, namely, in acute keratoconjunctivitis and Pseudomonas aeruginosa infections. No case suitable for intraocular injection presented itself.

The authors summarized their findings as follows:

1. Bacitracin was well tolerated and did not delay healing of the cornea when it was used in strengths as indicated.

2. Bacitracin did not permeate the intact cornea, but did pass through abrasions of the cornea.

3. When bacitracin was injected into the vitreous, opacities of the vitreous occurred.

4. No fundal change was observed.

J. Woodhull Overton, M.D.

The Prognosis in Uveal Melanoma. B. Benjamin, J. N. Cumings, A. J. B. Goldsmith, and Arnold Sorsby. *Brit. J. Ophth.*, 1948, 32: 729.

All cases (285) of uveal melanoma at the Royal London Hospital and at the Royal Eye Hospital, London, occurring between 1925 and 1939 were studied histologically and correlated with the mortality statistics. The choroid was involved in 250 cases, the ciliary body in 30, and the iris in 5. The mortality due to melanoma of the ciliary body was somewhat higher than that due to melanoma of the choroid. As regards sex, no statistical difference was noted. The mean age of the patients upon excision of the eye was 53.7 years and the average age 56.3 years. The majority of all the cases, 53 per cent, occurred in patients between 50 and 69 years of age. Callender, Wilder, and Ash, in their study of the American Registry of Ophthalmic Pathology (1,418 cases), also found that uveal melanoma is concentrated in the 40 to 70 year age group.

Histologically, the spindle cells B predominated, accounting for nearly 60 per cent of the total, while the epithelioid cells amounted to 8.8 per cent. Heavy pigment was present in 13.7 per cent, and heavy reticulin in 8.3 per cent. The only histological correlation was the heavy pigment with epithelioid cells.

The general prognosis has improved considerably during the last 70 years, as eyes are now usually removed while the melanoma is confined to the uveal tract. In the present series the survival rate was 80.7 per cent for the 5 year period, declining to 73.4 per cent for a period of 10 years. The highest mortality occurred in the second year. The prognosis was better for the patients under 40 years than for those in the older groups. The outlook was worse with epithelioid cells, but otherwise no prognostic significance could be assigned to the cell type. The mortality is influenced by the content of pigment and reticulin, heavy pigment and low reticulin being unfavorable prognostic signs. James E. Lebensohn, M.D.

Changes in the Ocular Fundus Associated with Pheochromocytoma of the Adrenal Gland: Report of 3 Cases. Gordon M. Bruce. *Arch. Ophth.*, Chic., 1948, 39: 707.

The chromaffin cells, or pheochromocytes, are responsible for the hormone production of the adrenal gland. Pheochromocytomas are chromaffin tumors of the adrenal gland. They are benign anatomically, but malignant physiologically. Three cases in children are reported, but most cases occur in the second to the fourth decade. While only 146 cases have been listed so far, the tumor is being detected with increasing frequency. In most cases death is due to pulmonary edema, shock, cerebral or subarachnoid hemorrhage, or chronic renal failure. Other tumors, particularly neurofibromas, are frequently associated.

The dominant finding is vascular hypertension, in the course of which pathologic changes may be found in the retina. The retinal picture cannot be differentiated from that encountered in hypertensive vascular disease. Because ocular symptoms may be the first sign of the disease, in vascular disease pheochromocytoma must be considered.

A positive diagnosis is made on the observation of typical paroxysmal attacks, evidence that the attacks are produced by a pressor substance, and roentgenographic evidence indicative of the tumor on perirenal insufflation. Thoracic pain of the anginal type is frequent. Other symptoms include sweating, lacrimation, salivation, hemoptysis, diarrhea, and pain in the hypochondrium. Glycosuria and hyperglycemia are common, and in many cases the basal metabolic rates have been greatly increased. Symptomatic paroxysmal hypertension may also occur with lead poisoning, eclampsia, tabes, angina pectoris, tumor of the thalamus, and disorders of the vagus nerve. The disease has also simulated gastric ulcer, shock, migraine, and cerebral tumor.

Treatment consists of surgical removal of the tumor. At present the death rate is 30 per cent. Three cases are reported (a boy of 12, a girl of 10, and a girl of 12). These patients were operated on at the Babies' Hospital, New York, by George F. Cahill. Two of the children made a complete recovery after operation; one child died while the tumor was being removed. JAMES E. LEBENSOHN, M.D.

Provocative Tests in Glaucoma. H. SAUL SUGAR. *Am. J. Ophth.*, 1948, 31: 1193.

The evaluation of provocative glaucoma tests was made in normal and glaucomatous eyes with a number of tests on the same persons, thereby not only comparing the tests individually, but also obtaining an over-all picture of a group of tests.

WATER TEST

The patient drinks a liter of water in 5 minutes, 2 hours after breakfast. Then tonometric readings (Schiotz) are made 0.5 and 1 hour later.

In 143 normal eyes of individuals ranging from 18 to 70 years of age, there was an average increase of intraocular pressure of 1.9 mm. Hg at the end of 0.5 hour, and a slight decrease of this average at the end of 1 hour. Many of the pressures increased from 23 mm. to 27 mm. and only a few increased to between 30 and 32 mm. Visual fields revealed no pathology in the latter cases.

Water tests on glaucomatous eyes were made with and without miotics in eyes subjected to operation and eyes not subjected to operation.

A control study was made on the same general group of glaucomatous eyes. Fifty-six eyes had an initial tension under 40 mm. Hg, and 5 had a tension of 40 mm. Hg or more. Fourteen eyes which had been operated upon and with simple glaucoma were observed as controls. Four quiescent narrow-angle glaucomatous eyes were observed. There were 3 eyes with glaucoma secondary to posterior lens dislocation.

In the normal series, the provocative tests revealed an average increase of pressure of 1.9 mm. Hg, but some cases revealed an increase of as much as 9 mm. Hg, which was higher than in some glaucomatous eyes. Thus this test is not specific.

The average 1 hour reading revealed a decrease in intraocular pressure when compared to the 0.5 hour reading. However, in some of the nonoperative glaucomatous eyes, the pressure at 1 hour was higher, with and without pilocarpine.

In eyes with simple glaucoma not operated upon, the rise in pressure was greater when the initial tension was higher.

The operative cases were too few to warrant conclusions. There was an increase of pressure in some of them, but there was also an increase of pressure in the controls with narrow-angle glaucoma, and in cases of secondary glaucoma due to lens dislocation. Therefore, the glaucomas cannot be separated by this test. A few eyes which were successfully operated upon and presented well filtering blebs did not show any significant rise in tension.

CAFFEINE TEST

Caffeine sodium benzoate was injected intramuscularly. In 32 eyes with simple glaucoma not operated on the results were not significant.

MYDRIASIS TEST

A rise in pressure of 7 mm. Hg (Schiotz) after the use of 2 per cent cocaine and 2 per cent euphthalmine as indicated from 1.5 to 2 hours later was considered a positive test by Jackson and Gradle.

In simple glaucomatous eyes with tension under 40 mm. Hg in which operation had not been done, the authors dilated the pupils with 4 per cent homatropine and 10 per cent neosynephrine. Tensions and pupillary measurements were made in 0.5 of an hour and 1 hour later.

In the homatropine group there was an average increase in intraocular pressure after 0.5 hour of 0.5 mm. Hg (range −4 to +8 mm.) with another 0.5 mm. rise the next 0.5 hour. The neosynephrine group revealed an average decrease of 1.7 mm. the first 0.5 hour and an average recovery of 0.2 mm. the second 0.5 hour. Pupils dilated from 1 to 2 mm. more on the average with neosynephrine.

In 2 of the quiescent eyes, which had previous acute glaucomatous attacks or were the fellows of such eyes, homatropine increased the tension but in 2 other eyes it did not. When neosynephrine was used, 2 eyes revealed no rise in tension, but 2 others revealed such a rise.

The mydriatic test is of value as a provocative test only when adequate pupillary dilatation has been obtained. An increase in tension usually occurs in 30 minutes but some cases reveal a rise in tension only after 4 or 5 hours. The angle blockage caused by the swelling of the iris root in the dilatation which results from mydriatic drugs can usually be counteracted rather easily. One should not hesitate to use any of the mydriatics except atropine and scopola-

mine for these tests in simple glaucoma, but there is danger in narrow-angle glaucoma or preacute glaucomatous eyes.

PRESSOR CONGESTION TEST

This test is the lability test of Bloomfield and Lambert, based on a combination of the cold pressor test and the jugular compression test.

An initial tonometric reading is made with the patient in the supine position. The sphygmomanometer cuff is placed around the neck of the patient while one of his hands is immersed to the wrist in chipped ice and water. The cuff is inflated to between 50 and 60 mm. Hg, for 1 minute. A reading is made and repeated after the pressure is released and the hand has been removed from the water.

In 192 normal eyes, this test gave an average increase of 3.6 mm. Hg (range −2 to +9 mm.).

The pressor-congestion test tends to increase the intraocular pressure, particularly when there is any defect in the mechanism controlling intraocular pressure. The author also believes that this test increases the tonus of the extraocular muscles and this would raise the intraocular pressure too. An increase over 9 mm. Hg or the elevation of tension over 30 mm. is suggestive of chronic simple glaucoma according to Bloomfield and Lambert. In this series of glaucomatous eyes, the pressure exceeded this 9 mm. in less than one-half of the cases and the normal series revealed a pressure of 30 mm. or over in only 20 per cent of the eyes. The anterior chamber puncture test was normal in 4 of the cases with tension of 30 mm. or more.

WATER AND PRESSOR CONGESTION TEST

This test was performed 2 hours after breakfast or lunch on normal and glaucomatous eyes. The tension was recorded, 1 liter of water given, and the pressor congestion test applied in 0.5 hour.

The average increase of intraocular pressure in 71 normal eyes was 5 mm. Hg (range −3 to +10). Three eyes revealed a pressure of 38 mm. Hg.

The results in glaucomatous eyes reveal that a greater increase in tension is shown with this test than with any of the others. Further comparison of these tests on the same eyes seemed to substantiate the earlier findings both in normal and glaucomatous eyes.

An increase of over 10 mm. Hg of pressure would certainly indicate a positive reaction. A negative result does not rule out glaucoma.

CONCLUSION

Combined water and pressor-congestion tests give higher readings than either test alone.

In the water tests, a positive result represents an increase of over 9 mm. or a rise to over 32 mm.; in the pressor congestion test a positive result represents an increase of over 9 mm. or a rise to over 33 mm.; in the combined tests a positive result represents an increase of over 10 mm. or over 38 mm. Hg.

The caffeine test was of no value.

Mydriasis is safe in simple glaucoma but has not given a significant rise in pressure. In narrow angle eyes it is the test of choice, but it should be controlled by miotics.

In borderline cases of simple glaucoma, repeated tonometry is an important diagnostic test.

J. WOODHULL OVERTON, M.D.

The Pressor Test for Glaucoma. GEORGE T. STINE. *Am. J. Ophth.*, 1948, 31: 1203.

This author confirmed the work of Bloomfield and Lambert as to the reliability of the lability pressor test for chronic simple glaucoma of the wide angle type.

The pressor test is based upon vascular variations within the globe in which a sudden strain is introduced so that increased lability manifests itself clinically. This test allows for an increase of blood flow into the eye and a mechanism for decreasing the outward flow of blood.

The patient is seated at a 30 degree angle from the horizontal. A sphygmomanometer cuff is applied around the neck, pontocaine (½%) is instilled into the eyes, and the tension is measured (Schiptz). The hand and wrist are placed in cold water (4°C) and the sphygmomanometer cuff is inflated to between 50 and 60 mm. Hg for 1 minute. The tension is taken at that time.

Patients with normal and abnormal eyes were used. The narrow angle cases were chosen mostly for this work but some wide angle cases were also checked.

The mean rise in pressure in the normal group, wide angle group, and narrow angle group was 1.94, 13.82, and 2.9 mm. Hg, respectively. This seems to be a valid test for wide angle glaucoma. Criteria for a positive test were: (1) a rise greater than 9 mm. of Hg and/or (2) a rise to more than 30 mm. of Hg. In this series of 35 patients, only 4 failed to show a rise above 30 mm. of Hg.

The increase in tension in narrow angle glaucoma approximates the normal so these two groups cannot be differentiated with this test. In 112 normal eyes tested by Bloomfield in this series, there were only 2 false positives. Narrow angle glaucomas are diagnosed on the basis of visual fields, the fundus picture, and mydriasis tests. The mean rise in pressure in the normal group, the narrow angle group, and the wide angle group under mydriasis was 1 mm. Hg, 14.33 mm. Hg, and 3.69 mm. Hg, respectively. Every case classified as narrow angle glaucoma gave a positive test.

The pressor test seems to be a good clinical test for diagnosing the wide angle type of chronic simple glaucoma. It is thought that the rise in the wide angle group is due to pathology in the drainage mechanism in the trabecula and canal of Schlemm, while in the narrow angle group the iris base blocks the angle. Patients who had a positive pressor test despite normal tension under miotics were all losing visual fields and visual acuity. However, the pa-

tients who had a negative pressor test had been without appreciable field loss for some time. There were only 14 eyes in this series.

The author summarizes his article as follows:

1. The pressor test should be used in conjunction with a gonioscopic examination for the best results.
2. The pressor test seems reliable for the detection of the wide angle type of chronic simple glaucoma, while mydriasis was the method of choice for the narrow angle type.
3. The mechanisms involved seem to be entirely different for the two groups.
4. The pressor test may be of value in progress of the visual field loss in the wide angle group.

J. Woodhull Overton, M.D.

EAR

Observations Upon the Loudness Recruitment Phenomenon, with Especial Reference to the Diagnosis of Disorders of the Internal Ear and Eighth Nerve. M. R. Dix, C. S. Hallpike, and J. D. Hood. *J. Lar. Otol.*, Lond., 1948, 62: 671.

The authors present the results of, and their observations upon, loudness balance tests carried out in 30 cases of unilateral deafness due to Ménière's disease and in 20 cases of degeneration of the eighth nerve, due to neurofibroma of the eighth nerve and other varieties of space-occupying lesions of the cerebellopontine angle. This choice of the two disorders was made by the authors because in the one, Ménière's disease, the primary lesion is now known to affect the endolymph system of the cochlea with its contained cochlear end-organs, while in the other, the primary lesion is of the cochlear nerve fibers within the internal auditory meatus.

The 30 cases of Ménière's disease all gave a characteristic history of paroxysmal vertigo, deafness and tinnitus, with the deafness substantially limited to one ear in the great majority. None gave any history of head injury, and general neurological examination revealed no abnormalities. On the other hand the 20 cases of eighth nerve degeneration which were studied included 11 cases of neurofibroma of the eighth nerve, in all of which the clinical diagnosis was confirmed by operative or postmortem findings. In addition, the remaining 9 cases studied in the category were other varieties of cerebellopontine angle lesions exhibiting well marked involvement of function of the eighth nerve and of these, 6 diagnoses were confirmed by operative or postmortem findings. Thus, the cases studied would appear to be well authenticated.

The loudness recruitment pattern with the audiograms, in 3 representative cases of their results in the 30 cases of Ménière's disease, are shown in the article. The authors state they found loudness recruitment to be present and complete in all 30 cases of Ménière's disease. The test results in 5 characteristic cases of eighth nerve degeneration are also shown; and the authors' summary of the results in the cases of eighth nerve degeneration showed loudness recruitment to be absent in 14 of the 20 cases. In the remaining 6 cases a slight amount of recruitment was present, and in some of these there was found a fixed upper loudness limit in the affected ear.

Thus, the loudness recruitment was shown to be characteristically present in a disorder of the end-organ of hearing, and to be characteristically absent in a disorder of the cochlear nerve fibers; in the latter case, a type of response which is identical with that found in middle-ear deafness.

Since this latter finding sharply contraverts the existing views, namely, those of Lonente de No and Fowler, upon the neurological mechanism of recruitment, the authors advance new hypotheses in explanation of their results, based upon recent experimental work on the physiology of hearing.

According to the authors, their finding of an unvarying occurrence of the recruitment phenomenon in Ménière's disease, a disorder of the end-organ of hearing, appears to be related to Pumphrey and Gold's theory, based on their recent experimental work, that the microphonic potentials of the cochlea arise somewhere in Corti's organ and play a vital part in determining both its sensitivity and frequency selectivity. The essayists find it pertinent to observe that the very nature of the recruitment phenomenon corresponds very well with a type of derangement well known in certain microphones. The example given is a carbon microphone which, in good order, yields an electric response which is linear over a wide range of sound pressures. However, in a faulty carbon microphone the response at low sound pressures may be very defective, while at high pressures it may be nearer the normal value.

The authors suggest that the absence of loudness recruitment in degeneration of the eighth nerve can be explained on the following assumptions:

1. That the nerve degeneration engendered by tumor pressure or infiltration is an evenly diffused one with a definite fiber survival rate.
2. That the relationship between stimulus intensity and loudness sensation depends upon a definite fractional increase in the number of activated cochlear nerve fibers which accompanies each ascending step of the loudness scale.

Eugene L. Derlacki, M.D.

Lempert Decompression Operation for Hydrops of the Endolymphatic Labyrinth in Ménière's Disease. Julius Lempert. *Arch. Otolar.*, Chic., 1948, 47: 551.

Ménière's disease has as its basic pathology a hydrops of both the vestibular and cochlear portions of the endolymphatic system. Treatment should be designed to relieve both the vertigo, which is vestibular in origin, and the tinnitus which is most likely cochlear in origin.

Partial section or electrocoagulation of the vestibular portion of the endolymphatic system, through a fistula created in the external semicircular canal, usually relieves vertigo but seldom relieves tinnitus. The histologic study of experimentally fenestrated

rhesus monkeys demonstrates that destruction of the vestibular endolymphatic system may occur without degeneration of the remaining endolymphatic system and organ of Corti.

An operation to effect complete degeneration of the endolymphatic system is described. The tympanic cavity is approached endaurally by eversion of a skin flap from the posterior wall of the canal, and enlargement of the bony meatus by a dental burr. The posterior one-half of the tympanic membrane is then reflected anteriorly and the opening is widened at the annulus tympanicus. The long process of the incus is severed and the stapes is removed. A burr is then used to remove the round window membrane and enlarge the window. The various steps are described and illustrated in detail.

Of the 10 patients operated on by this technique, 9 were freed of vertigo and tinnitus and 1 was freed of vertigo only. JOHN R. LINDSAY, M.D.

MOUTH

Facial Injuries Followed by Meningitis, with Recovery. A. J. B. PHILLIPS. *Brit. J. Plast. Surg.*, 1948, 1: 172.

The author's patient suffered severe, soft tissue injuries in a fall, face foremost, from a height of 17 feet. Multiple lacerations extending in the midline from the hairline to the symphysis menti were impregnated with coal dust; those of the tip of the nose, both lips, and chin were full thickness in depth; and the laceration of the forehead exposed the frontal bone but there was no visible fracture.

Twelve hours after the injury, after a preoperative dose of 500,000 units of penicillin and antitetanic serum, the wounds were débrided and sutured in layers. The only fractures which were noted were of the nose.

Penicillin was administered regularly. The following morning, a fever of 100 degrees was noted with a productive cough. A course of sulfadiazine was started. This was discontinued after 6 gm. had been administered because of cyanosis. A serous fluid from the nostrils was designated as cerebrospinal rhinorrhea. The general condition and the condition of the facial wounds were satisfactory and the temperature was normal on the third day. The patient had had 2,700,000 units of penicillin intramuscularly and 6 gm. of sulfadiazine orally.

On the fourth day, loss of consciousness occurred with a temperature of 103.6 degrees, stertorous breathing, and marked rigidity of the neck. Lumbar puncture revealed turbid fluid under pressure and culture later revealed the Staphylococcus aureus. Penicillin (15,000 units) was given intrathecally upon diagnosis of the meningitis; an additional amount was given intramuscularly and sulfadiazine was given orally. Recovery began within several hours.

In the treatment of the established meningitis, 8,600,000 units of penicillin were given intramuscularly, 90,000 units of pure penicillin were given intrathecally, and 24 gm. of sulfadiazine were given orally. Recovery was rapid and on the seventeenth day when the temperature and pulse were normal, penicillin was discontinued. The patient felt good from the tenth day onward and was allowed up on the twenty-first day. Up to the present time no abnormal symptoms, mental or physical, have resulted from the meningitis. EARL H. KLABUNDE, M.D.

NECK

The Clinical Aspects of Chronic Thyroiditis. HOWARD PATTERSON and GEORGE STARKEY. *Ann. Surg.*, 1948, 128: 756.

Chronic thyroiditis is not a rare disease, and it is most important for the patient that the situation is fully recognized at operation. Chronic thryoiditis may be divided into three groups: (1) struma lymphomatosa of Hashimoto; (2) struma fibrosa of Riedel; and (3) the giant cell type of DeQuervain.

Hashimoto's disease is characterized by a diffuse lymphocytic involvement of the thyroid gland; it is very rare in males and occurs chiefly in women at or near the menopause. Adhesions to the surrounding structures do not occur, but the thyroid is usually diffusely enlarged, pressure symptoms are mild, and the patient is apt to be myxedematous. The author performs symmetrical conservative thyroidectomy followed by x-ray therapy.

Riedel's disease, or struma fibrosa, occurs in both sexes but predominantly in women. The process is at first localized and spreads over the gland; the involved portion is pale and stony hard with dense masses of fibrous tissue, and is usually very adherent to the surrounding structures. Freeing of the trachea by excision of the isthmus is all that is indicated. The disease is often confused with malignancy, and unwise and harmful surgery may follow.

The giant cell type of thyroiditis of DeQuervain does not involve the thyroid gland diffusely, but there is some tendency toward adherence to the surrounding structures. The pathological picture may closely simulate tuberculosis. X-ray therapy following positive diagnosis may be the treatment of choice.
F. J. LESEMANN, JR., M.D.

The Frequency of Hyperthyroidism, Its Causes and Therapy (Ueber die Haeufigkeit hyperthyreotischer Zustandsbilder, ihre Ursachen und ihre Behandlung). J. WALDSCHUETZ. *Wien. med. Wschr.*, 1948, 98: 510.

A comparison is made between a group of patients with hyperthyroidism treated between 1919 and 1921 and another group treated between 1945 and 1947, with special attention to relations between the disease and the nutritional changes, and the mental and physical traumas caused by the war.

Exophthalmos was recorded in 19 per cent of the first and only 11 per cent of the second group. The receding frequency of this phenomenon has been reported by several other writers.

Nystagmus, never found in the first group, was reported in 4 per cent of the second group and was apparently of central origin.

An enlargement of the thyroid gland was present in 75 per cent of the first and 65 per cent of the second group. In most cases the gland was smaller and softer in the last mentioned group than in the first.

Tachycardia was noticed in 65 per cent and 40 per cent, respectively. Fifty per cent of the patients in the first group and 60 per cent of those in the second group were complaining of anxiety, dyspnea, precordial pain, and other cardiac symptoms.

Excessive perspiration was reported by 52 per cent of the first group as contrasted to 42 per cent of the second group.

Hyperthermia was recorded in 8 per cent of the first group as contrasted to 3 per cent of the second.

While gastrointestinal disturbances were registered in only 8 per cent of the first group, they occurred in 20 per cent of the second group.

Considerable losses of weight beyond those that could be attributed to malnutrition were found in 45 per cent and 28 per cent, respectively.

Disturbances caused by food and vitamin deficiencies or poor quality of food, such as amenorrhea, dysmenorrhea, alopecia, and loss of libido, were noticed in 4 per cent of the first and 12 per cent of the second group.

A great frequency of chronic deforming arthritis, probably of neurotrophic origin, was found in both groups.

Tremor was recorded in 75 per cent of the first and 35 per cent of the second group.

JOSEPH K. NARAT, M.D.

The Treatment of Thyrotoxicosis. D. M. DUNLOP. *Edinburgh M. J.*, 1948, 55: 257.

Dunlop observed 149 thyrotoxic patients. Of these, 19 were treated by thyroidectomy and the remainder were treated by antithyroidal drugs. Eighty-three were hospitalized, while 66 were treated as out-patients throughout. The author used 0.2 gm. thiouracil three times a day.

Blood cholesterol and basal metabolism determinations were discarded early as criteria for the efficacy of treatment. Weight seemed to be a good means of judging. Tachycardia was slow to respond and occasionally persisted even after the basal metabolic rate had become normal. Auricular fibrillation reverted occasionally to normal rhythm but usually required quinidine for control. Innocent glycosuria was cured by thiouracil or thyroidectomy; severe diabetes frequently was ameliorated by either. Exophthalmus was unaffected by thiouracil, but lid retraction was more effectively influenced by thyroidectomy than by thiouracil.

Enlargement of the thyroid due to overstimulation by the thyrotropic hormone of the pituitary gland occurs when the patient is overdosed with thiouracil. Myxedema induced by thiouracil is temporary, but when it is induced by thyroidectomy it is permanent.

Sixteen patients (11%) showed toxic effects which led to abandonment of the drug in 9 (6% of the entire group or 56% of those who developed reactions). There was no mortality in this series, although a mortality of 0.5 per cent was reported in the older literature.

In order to avoid relapse, treatment should last a year or longer.

Nineteen, or 13 per cent, of the entire series of 149 patients were treated by thyroidectomy. The reasons were for the sake of appearance in large goiters and mechanical pressure signs. One patient had uncertain results, 7 patients had drug reactions, 2 were drug resistant, and 3 were persistent fibrillators.

Dunlop believes that the drug treatment is the treatment of choice in primary hyperthyroidism, recurrent goiters, and elderly patients, while thyroidectomy is preferable when the goiter is large or nodular, or there is resistance or sensitivity to the drug.

F. W. S. MODERN, M.D.

Cancer of the Larynx. A Statistical Study. LEROY A. SCHALL and JOHN J. AYASH. *Ann. Otol. Rhinol.*, 1948, 57: 377.

The authors followed up 418 cases of laryngeal cancer. Only 8 per cent occurred in females. The average age of the males was 60 years and that of the females 40 years. Tracheotomy was required in 80 cases; in 46 of these, it was preliminary and in 34 it was done during or shortly after irradiation. Two hundred and forty-six patients were treated by external irradiation. Carcinoma (grades 1 and 2) is more curable by surgery and irradiation. Limited lesions of grades 3 and 4 are best treated operatively followed by irradiation.

The success of external radiation depends on the site and extent of the lesion. The more localized the lesion is the more radiosensitive it is, while cord lesions which have infiltrated the opposite side are radioresistant, and those beyond the confines of the larynx are nearly hopeless. Cancer arising from the false cords and epiglottis is radiosensitive, but becomes resistant if it infiltrates and fixes these structures.

Among 59 patients treated by laryngofissure only 39 were ideal cases, and even among these 10 developed recurrences. The recurrences developed mostly when the cancer passed the commissure. The nasal tube is inserted before anesthetization.

Ninety-seven patients were treated by laryngectomy with 4 operative deaths.

Closure without drainage seemed feasible.

Laryngectomy can still be done if external radiation fails, although healing may be delayed. The survival rate following laryngectomy for more than 5 years was 64 per cent.

In 19 cases of distant metastases 11 lesions were in the lung, 3 in the brain, 2 in the spine, and others were scattered.

Early rehabilitation of the patient by means of the esophageal voice is important.

F. W. S. MODERN, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Hypertensive Syndromes Due to Craniovertebral Malformations: Clinical, Radiologic, Neurosurgical Observations (Sindromi ipertensive da malformazioni cranio-vertebrali: rilievi clinici, radiologici, neurochirurgici). G. VERCELLI, F. MASCHERPA, and G. M. FASIANI. *Chirurgia*, 1948, 3: 243.

The authors report 3 cases which illustrate the value of surgical treatment for the correction of the serious disturbances of the nervous system caused by some malformations of the occipital bone and of the first cervical vertebra. The first patient presented a fusion of the atlas with the occipital bone, the second a malformation of the atlas and axis, and the third a typical example of basal impression in which the floor of the occipital fossa was convex and the external occipital protuberance in the horizontal plane passed through the mastoid apices. In the first and third patients the symptoms were caused, at least to a great extent, by blockage of the circulation of the cerebrospinal fluid which resulted in the formation of a ventricular hydrocephelus, while in the second patient the symptoms were the result of direct compression of the bulbomedullary tissues.

Experience has shown that the anatomic lesions at which surgical intervention must be aimed are essentially the following: (1) the decreased capacity of the cerebellar fossa due to upward displacement of the mass formed by the foramen magnum and the adjacent portions of the occipital bone; (2) the change in form of the foramen magnum, which is often greatly reduced in one of its diameters; (3) the changes in the dura mater which are modelled on the bone changes and are capable of exercising a compressive action even after removal of the bone malformation; (4) the changes in form and capacity of the upper opening of the spinal canal, which vary with the different types of vertebral malformations; (5) the adhesions which fix the cerebellum to the cerebral trunk and the medulla, and contribute to the compression of these structures and to the disturbance of the circulation of the cerebrospinal fluid; (6) the impaction of the cerebellar tonsils into the occipital foramen and the spinal canal; and (7) the hydrocephalus due to obstruction of the basal foramina as a result of the foregoing defects.

The surgical treatment must consequently be carried out in accordance with the following program: (1) removal of a more or less extensive portion of the occipital bone and of the posterior border of the foramen magnum; (2) removal of the posterior arch of the first and, if necessary, of the second and third cervical vertebrae; (3) ample opening of the dura mater, which should not be reconstructed; (4) liberation of the cerebellar tonsils; and (5) search for and section of adhesions between the cerebellum and the cerebral trunk to allow free passage of the cerebrospinal fluid.

A special procedure had to be used in the third patient, in whom occipital and vertebral decompression and removal of the obstruction of the foramen of Magendie had resulted in disappearance of the subjective and objective symptoms, but after a few months the signs of intracranial hypertension reappeared because of renewal of the adhesions between the cerebellum and the cerebral trunk, and of the obstruction of the fourth ventricle. Under the circumstances a supraotic ventriculostomy was performed and led to definitive cure.

RICHARD KEMEL, M.D.

Delays and Errors in the Diagnosis of Brain Tumor. FREDERICK C. REDLICH, REMBRANDT H. DUNSMORE, and EUGENE B. BRODY. *N. England J. M.*, 1948, 239: 945.

This brief article should have wide circulation and be read not only by psychiatrists and surgeons, but by neurologists, internists, and general practitioners as well.

The authors have emphasized how frequently the presence of brain tumors is overlooked in a cursory examination of the patient, and in their review of 100 consecutive proved cases of intracranial tumor they find that all too much importance is placed on the mechanical methods of diagnosis rather than the careful eliciting of history and the repeated (if necessary) careful neurological and physical examination. They stress the importance of a thorough investigation of the causes of physical impairment, of headache, and of epileptiform seizures.

It is admitted that functional and psychological factors may delay the complete diagnosis, and while public health education should be designed to avoid such delay, such education should be stressed at both lay and professional levels. JOHN MARTIN, M.D.

Transorbital Leucotomy. WALTER FREEMAN. *Lancet*, Lond., 1948, 2: 371.

Fiamberti is given credit for simplifying the operation of frontal leucotomy in 1937, which operation had been introduced by Moniz one year previously. On the basis of unpublished but previously reported work the author believes that transorbital leucotomy which undercuts areas 9 and 10 on the Brodmann Chart seems to be a valid procedure.

The operation, which it is claimed can be carried out by the properly trained psychiatrist, consists of the introduction of the leucotome under the upper eyelid, through the conjunctival sac, and across the orbital vault, where, with a slight hammer tap, it is driven through the orbital plate. No damage to the globe save occasional subscleral hemorrhage has been observed. The instrument is a tool steel shaft measuring 12 cm. long and 4 mm. wide tapering for the

last 6 cm. to a rather fine slightly beveled point. Proper maneuvers are described which serve to sever the fibers in the lower portion of the thalamofrontal radiation. The possibility of laceration of the arteries in the depths of the fissures on either the medial or lateral surface of the frontal lobe must be born in mind. Moderate pressure is maintained over the eyelids to prevent excessive orbital hemorrhage. Circumorbital ecchymosis persists for several days. The procedure is then repeated through the opposite orbit. It is advised that the postconvulsive phase of electroshock therapy is the time of choice for the operation. Recovery from the operation is said to be very rapid.

Complications have been observed in only 3 of 100 cases. In all of these there was bleeding with severe inertia, and paralysis in one and mild hemiparesis in the others. Undesirable personality changes are minimal. One-third of the schizophrenics and more than half of the individuals treated have been discharged from the hospital.

The operation is claimed to be most effective in certain patients in whom tension is a prominent feature of the illness and who are beginning to become chronic sufferers in spite of more conservative therapies. It finds its most successful application in patients who are benefited and then have a relapse or who are being carried on maintenance shock therapy. Severe emotional dilapidation is the outstanding contraindication.

ALLAN D. CALLOW, M.D.

PERIPHERAL NERVES

Clinical Assessment of Peripheral Nerve Injuries. W. R. HENDERSON. *Lancet*, Lond., 1948, 2: 801.

This article is principally concerned with the value of Tinel's test in peripheral nerve injuries and is based on the author's experience with 400 cases observed in prisoner-of-war hospitals in Germany from 1940 to 1945. When it is interpreted according to its original description, Tinel's test is useful in assessing the amount of regeneration after about the fourth month following injury or suture of the nerve, provided it is interpreted by comparing sensations from the lesion and the distal segment.

The test fell into disrepute probably because too much emphasis had been placed on the sole presence or absence of response from the distal segment of the injured or sutured nerve. The author stresses the importance of palpation over the lesion as well as over the distal segment to perform and interpret the test correctly. It is believed that the test can be of value in assessing the prognosis of brachial plexus injuries after a few months, such as the traction injuries observed in parachute jumpers.

On the basis of Tinel's test, the author classifies nerve injuries into four clinical groups, assuming that sufficient time has elapsed to allow the fibers to regenerate at least several inches along the distal segment of the nerve. When no regeneration occurs, tapping at the site of the lesion elicits a strong response with no response to palpation along the distal segment. A strong indication of a neuroma with negligible regeneration distally is shown by a strong response over the site of the lesion and a feeble response over the distal segment. Partial regeneration of a nerve is the most difficult type of lesion to interpret by Tinel's test. Complete regeneration will show a strong response of tingling along the distal segment advancing at the rate of about 3 inches a month. Also included in the article is a description of tests used to exclude damage to the nerves in recent injuries.

JOHN L. BELL, M.D.

MISCELLANEOUS

The Results of a Specifically Co-Ordinated Plan of Medical and Surgical Treatment of Essential Hypertension. LOYAL DAVIS, HOWARD A. LINDBERG, and N. V. TREGER. *Ann. Surg.*, 1948, 128: 770.

In 1934, Barker and Davis formulated a plan for the study of patients with essential hypertension for whom surgical therapy might be undertaken. In 1939, they reported upon their clinical and experimental experiences and attempted to make clear for others the principles upon which their work was being carried out, in the hope that eventually it would lend itself to comparison with that of other groups engaged in similar work.

The authors stress the point that before surgical procedures for hypertension can be evaluated, an agreement must be reached as to exactly which type of patient is being operated upon or should be operated upon. They studied some 700 patients with essential hypertension and attempted to classify them according to therapeutic and clinical types. Finally, they decided early to limit the surgical therapy to one of the types of essential hypertension and they chose that group for which medical treatment was inadequate and the progress of the disease appeared to be imminently fatal.

The first group of hypertension they termed the fluctant group; the second, the plethoric; the third, menopausal hypertension; the fourth, the high diastolic type of hypertension; the fifth, arteriosclerotic hypertension; and the sixth, malignant hypertension.

Each of these particular groups are discussed and a case history is given for each group. The authors chose their surgical cases from the group of patients whom they classified as having the high diastolic type of hypertension. They further restricted their choice to those in this group who had been given an adequate and thorough trial of therapy with the thiocyanates and had proved to be resistant to this drug; that is to say, their diastolic and systolic pressures and their symptoms could not be improved by cyanate blood levels below those which produced toxic symptoms.

Another indication for the choice of patients was that they should have a labile blood pressure as evidenced by a group of pressor and depressor tests. General considerations upon which the surgical indications were based were that the patients should

have systolic blood pressures over 200 and diastolic pressures over 100 mm. of mercury; that there be no evidence of chronic glomerulonephritis or pyelonephritis and no significant peripheral vascular sclerosis; and that the clinical course be shown to be progressive, but not entering the malignant phase of hypertension. The average age of the patients operated upon was 40.08 years, with a mean age of 39 years.

A discussion of the various pressor and depressor tests which were used on these patients is given.

The surgical procedures and the results in 25 patients with the high diastolic type of hypertension are presented.

The authors believe that sympathectomy alone has not been successful in permanently reducing the blood pressure levels in the high diastolic type of hypertension regardless of the extent of the operation. However, in some cases the subjective symptoms have been improved temporarily although the clinical course of the disease has remained unchanged.

Sympathectomy has caused patients in this group, who have been resistant to thiocyanate therapy preoperatively, to become sensitive to the administration of this drug. This result has been confirmed by laboratory experiments upon monkeys and dogs. The physiological explanation for this effect has not as yet been explained to our satisfaction.

There has been no significant change in the blood pressure levels or heart size, unless the patients have been given thiocyanates postoperatively.

In the high diastolic type of hypertension, vasopressor or vasorelaxor tests have not proved to be sufficiently accurate to show exactly which of these patients should be operated upon.

The medical management of patients of this group, particularly with the administration of thiocyanates properly controlled, is good in the early stages of the disease, but sooner or later all of the patients become resistant to this drug.

The results of surgical therapy in patients with hypertension can be evaluated only by a comparison with specific groups of patients with types of hypertension based upon their clinical symptoms and course. The authors believe that the types of hypertension which have been shown to respond well to medical management will show good results from surgical therapy alone, but the selection of patients for operation should be made not upon blood pressure ranges alone but upon the characteristic symptoms and clinical course of the disease. Until comparison of the results of surgical therapy is made upon accepted classifications of the clinical symptoms and course of this disease, confusion in interpretation of the surgical results will exist.

HOWARD H. LANDER, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Carcinoma of the Breast. Sir Stanford Cade. *J. Am. M. Ass.*, 1948, 138: 1083.

The incidence of cancer of the breast is increasing in England and Wales and now accounts for over 20 per cent of the deaths from cancer in women. Increasing longevity, and possibly the falling birth rate with associated decreasing lactation are among the factors believed to be responsible.

Nine-hundred and fifteen patients with cancer of the breast were treated at the Westminster Hospital, the Mount Vernon Hospital, and the Radium Institute, London, during the period from 1925 to 1948 by the following methods:

Surgery alone	381
Radium alone	144
Surgery and radium	233
Recurrent cases, radium treatment	157
Total	915

The over-all survival rates of 348 patients who could be traced 15 years or more were as follows:

	Total number	Percentage of survival		
		5-year	10-year	15-year
Stage 1	97	87	65	36
Stage 2	138	29	29	12
Stage 3	95	20	15	7
Stage 4	18	0	0	0

The mean life expectation in untreated breast cancer (at age 55) is 39.3 months. With treatment under average conditions the mean life expectation is 5.8 years; under the best conditions it is 12.9 years. By "conditions" is meant the factors applying to the patient, to the disease, and to the methods of treatment.

Important conditions which apply to the patient and the disease and their effect on prognosis are:

1. *Age.* Excepting in very young patients under 25 years of age, in whom cancer is more malignant, and in very old patients over 75, in whom cancer may be less malignant, age does not affect the malignancy of breast cancer.

2. *Clinical and histologic types.* The scirrhous and medullary types of cancer are most malignant and the papillary and intraductile types are least malignant.

3. *Duration of symptoms.* This is of little value in predicting malignancy, in part because so many histories are inaccurate, and also because the duration is of less importance than the *rate* of growth.

4. *Physiologic state of the breast.* Pregnancy increases the rate of growth of breast cancer, but the growth is most rapid during lactation.

5. *Extent of disease.* This is most important of all. The most valuable clinical classification is that of Portmann, which in simplified form and with minor modifications is as follows:

Stage 1. Tumor of the breast only.

Stage 2. Tumor of the breast and cutaneous changes and/or axillary glands.

Stage 3. Tumor of the breast and supraclavicular glands or contralateral axillary glands, or fixation to the pectoral fascia.

Stage 4. Skeletal or visceral metastasis.

The choice of treatment for cancer in the various stages and the results obtained are as follows:

Stage 1. The treatment of choice is radical mastectomy alone, as shown by the following rates of survival for 5 and 10 years with various methods of therapy.

	Surgery alone	Radium alone	Surgery and radium
Five year survival	87%	70%	78%
Ten year survival	65%	60%	63%

Stage 2. In these cases with axillary metastases the treatment of choice is radical mastectomy combined with postoperative radiation. Radiation alone is nearly as good as surgical treatment alone in all types of stage 2 cases. With surgery and postoperative irradiation the 5 year survival rate is raised from 29 to 35 per cent, and the 10 year survival from 25 to 32 per cent. The results in stage 2 cases by various methods of treatment are:

	Surgery alone	Radium alone	Surgery and radium
Five year survival	29%	25%	35%
Ten year survival	25%	21%	32%

Stage 3. Irradiation alone has given better results than surgical treatment, and is the method of choice, as shown by the following results:

	Surgery alone	Radiation alone	Surgery and radiation
Five year survival	9%	15%	10%
Ten year survival	7%	13%	9%

Radical mastectomy is considered the method of choice in surgery. The operative mortality is low—1.65 per cent in 11,014 mastectomies in London and the main university hospitals in England and Wales. Radical mastectomy is unsuitable for patients with edema of the skin, discrete cutaneous nodules, and large fixed or extensive lymph nodes. Simple mastectomy is suitable only in bad surgical risks, and in aged persons for the removal of a fungating mass.

Radiotherapy alone is the method of choice for stage 3 lesions and postoperative irradiation is of value in

stage 2 cases which present proved axillary metastases. The relative merits of preoperative and postoperative irradiation are difficult to evaluate since the statistics cited do not show the stages of the disease. However, it is stated that in 448 cases analyzed between 1930 and 1942, the survival rate with preoperative irradiation was greater than with postoperative treatment, namely, 73 per cent in the former and 53 per cent in the latter.

The over-all 5 year curability of 348 traced cases of all stages of cancer of the breast is 39 per cent, and varies from 87 per cent in stage 1 to 0 in stage 4.

FRANK B. QUEEN, M.D.

Surgical and Radiation Treatment of Cancer of the Breast. ROLF BULL ENGELSTAD. *Am. J. Roentg.*, 1948, 60: 776.

The author reports the results of a 5 to 10 year follow-up study of 1,384 patients with cancer of the breast. Of these, 680 patients were followed for a period of 10 years. The plan of treatment is based on the stage of development of the disease.

Operable cancer of the breast with no clinical signs of pathologic spread is designated as stage 1. Treatment was surgical, with postoperative irradiation.

Operable cancer of the breast with clinically or histopathologically demonstrable operable metastases to the axillary and lymph nodes is defined as stage 2. Treatment was surgical, with postoperative irradiation, and ovarian irradiation with from 1,200 to 1,500 roentgens over two or three pelvic fields, followed by the administration of 100 mgm. of testosterone propionate three times a week for a period of 10 weeks.

Inoperable cancer of the breast, or inoperable axillary or infraclavicular metastases or supraclavicular metastases, is defined as stage 3. Treatment in these cases was the same as that administered to patients in stage 2—roentgen irradiation, operation, and hormone therapy.

Inoperable tumor with distant metastases is defined as stage 4. These patients were treated with ovarian irradiation and testosterone injections.

Collective results including the four stages of cancer showed 520 of 1,377 patients (37.8%) to be symptom-free after 5 years. The results obtained in the treatment of cancers in stages 1, 2 and 3 were found to be as follows: of 949 patients with operable and inoperable cancer, 498 (52.5%) were symptom-free after a period of 5 years.

Of the patients with stage 1 and stage 2 cancers, who were followed for 5 years, 55.6 per cent were symptom-free following preoperative irradiation and radical operation, 66.7 per cent were symptom-free after preoperative and postoperative irradiation plus radical operation, and 69.0 per cent were symptom-free after radical operation plus postoperative irradiation.

In the author's survey of a smaller group of patients who had been treated in later years, he observed still further improvement in results. Twenty-two patients who were operated upon, with postoperative treatment, have been symptom-free for a period of 5 years (constituting 86 per cent of patients with stage 1 and stage 2 cancers who were treated in later years). The author believes this method of treatment to be ideal for patients with stage 1 and stage 2 tumors.

The methods of radium and roentgen administration, as well as dosages, are discussed in detail.

JANE C. MACMILLAN, M.D.

TRACHEA, LUNGS, AND PLEURA

Rupture of Bronchus Due to External Chest Trauma; Report of 3 Cases with Recovery. PAUL H. HOLINGER, ALBERT R. ZOSS, and KENNETH C. JOHNSTON. *Laryngoscope*, 1948, 58: 817.

Rupture of a bronchus is an unusual and serious complication of severe external trauma to the chest. Kinsella and Johnsrud presented a very complete review of the topic in a recent publication and were able to uncover only 38 cases in the literature. The first report of a patient surviving this type of injury was made by Krinitski, in 1928. In this case, complete bronchial stenosis was noted as an incidental postmortem finding, the apparent result of chest trauma suffered 21 years previously. The second instance of recovery was reported in 1939 by Jones and Vinson, who were the first to establish the diagnosis clinically in a nonfatal case. Cases with recovery have since been reported with increasing frequency, testifying to the increasing awareness of the entity and also to the recent advances in the treatment of severe thoracic injuries.

Three cases with recovery are presented in detail to emphasize further the not too rare occurrence of traumatic bronchial rupture and to call attention to the complexities of treatment.

Bronchial rupture is a relatively rare complication of severe, nonpenetrating, external chest trauma. Patients who survive such major injuries are being clinically recognized with increasing frequency.

Traumatic bronchial rupture inevitably results in cicatricial bronchial stenosis. In the majority of cases this stenosis is complete.

A pathological sequela in cases with residual complete bronchial stenosis is a chronic atelectatic lung with reduction in respiratory capacity. Unique and noteworthy is the absence of complicating infection in most of these chronic atelectatic states.

Diagnosis in the intermediate and late clinical phases is dependent upon a history of severe chest trauma, the discovery of a persistent lung collapse, and the bronchoscopic and bronchographic findings of complete bronchial occlusion.

In the initial phase of bronchial rupture, treatment of the concomitant severe chest injury is the primary concern. The possibilities of early surgical repair of bronchial disruptions warrant further investigation.

In the management of old bronchial injuries one is handicapped by the lack of basic cardiopulmonary studies. Therapeutic pneumothorax and thoraco-

plasty are recommended under certain specified conditions. Resection is indicated in the rare case that develops complicating pulmonary infection.

JOHN E. KIRKPATRICK, M.D.

Traumatic Bronchial Rupture with Occlusion. PHILIP J. HODES, JULIAN JOHNSON, and JOSEPH P. ATKINS. *Am. J. Roentg.*, 1948, 60: 448.

Bronchial tears are usually due to crushing chest injuries and are often fatal. When patients survive the injury, they may subsequently develop complete bronchial occlusion and pulmonary collapse. Thirty-two cases of bronchial tears have been recorded in the literature since 1889. Ten of these patients survived the immediate effects of injury and developed bronchial occlusion. In every instance the bronchial defect lay immediately adjacent to or within a few centimeters of the bifurcation of the trachea. Bronchial tears are attributed to two factors: (1) compression of the bronchus between the elastic chest wall and the rigid spine, and (2) abnormally high air pressures within the bronchus at the time of the impact, due to the inadvertent closing off of the larynx by the victim as he tries to protect himself from the onrushing blow.

The patients usually exhibit shock, dyspnea, anoxia, interstitial emphysema, and cough. Roentgenograms immediately after injury may reveal fractured ribs, interstitial emphysema, pneumothorax, pulmonary compression, and mediastinal shift. Therapy at this stage must be directed toward relieving the above signs and symptoms. If the patient survives, bronchial occlusion then begins to take place. Usually there exists a period of days or weeks between the date of injury and the time of complete bronchial occlusion by cicatrix formation. Bronchograms reveal a cup-shaped pouch at the site of occlusion. Therapeutic measures at this stage have included pneumothorax, occasionally helpful, and pneumonectomy, usually very helpful. Thoracoplasty has not been used to date. It is of interest that these collapsed lungs, removed at operation, show no evidence of infection in contrast to the usual atelectatic lung.

The authors report the case of a 36 year old man who had been violently injured and who developed complete bronchial occlusion of the right main stem bronchus with total collapse some 4 months after injury. A pneumonectomy was performed and the patient was completely relieved of his symptom of severe dyspnea.

JESSE E. THOMPSON, M.D.

Arteriovenous Fistula of the Lung Treated by Ligation of the Pulmonary Artery. GEORGE B. PACKARD and JAMES J. WARING. *Arch. Surg.*, 1948, 56: 725.

The presence of arteriovenous fistula in the lung has been recognized clinically only during the past few years. The steadily increasing number of cases reported suggests that it is much more common than supposed. The stereotyped syndrome of cyanosis, clubbing of the nails, and polycythemia, without abnormality of the heart, is accompanied by roentgenographic observations which are practically diagnostic.

The possible relationship of this condition to hereditary hemorrhagic telangiesctasia is indicated, and the incidence of multiple lesions is emphasized.

Consideration is given to the distinctive features of the pulmonary circulation as compared with the systemic circulation, which may permit some variations in the treatment of pulmonary arteriovenous fistula as compared with treatment of fistula in the systemic circulation. Apparently arterial connection between the pulmonary artery and bronchial artery branches is hardly to be compared with the free collateral circulation existing in the systemic circulation.

Report is made of one of the early cases in which the condition was recognized and one of the early cases in which there was surgical treatment. It is known that many more cases, in which the condition has since been recognized and treated, are in the process of being reported. As far as we know, this is the only case in which the condition was treated, and, to date, beneficially, by simple ligation of the pulmonary artery.

JOHN J. MALONEY, M.D.

The Problem of the Solitary Lung Tumors. DONALD BRIAN EFFLER, BRIAN BLADES, and EDWARD MARKS. *Surgery*, 1948, 24: 917.

Mass roentgenography has resulted in the discovery of an occasional solitary shadow, or spot, on an otherwise normal lung field. The diagnosis and management of these asymptomatic lesions may constitute a very real problem. In the past, observation has been the accepted procedure in the management of these patients. This has resulted in the assumption that the majority of these lesions were probably benign, otherwise the patient would have re-established contact with the physician.

With the continued improvement in surgical and anesthesia techniques, a definite changed attitude has been evolved. The authors review 24 cases in which a round pulmonary asymptomatic lesion was discovered through routine examination. Operation was advised for each of the 24 patients, at least for the purpose of biopsy. All consented and were subjected to thoracotomy. All of the lesions were considered benign neoplasms preoperatively. However, 15 per cent of the tumors proved to be malignant neoplasms after adequate tissue studies were performed. It is believed that this in itself justifies surgical exploration of every solitary tumor of the lung, even though the patient is symptom-free and the lesion has every indication of being benign.

STEPHEN A. ZIEMAN, M.D.

Bronchial Carcinoma. R. C. BROCK. *Brit. M. J.*, 1948, 2: 737.

The improvement in operability of bronchial carcinoma is due largely to the fact that patients are seen early, rather than to improvement in the surgical technique. Operative technique is now largely

standardized. Further improvement in curability is dependent upon earlier recognition of the signs and symptoms.

The clinical features leading to the diagnosis of bronchial carcinoma are: (1) an unexplained cough; (2) stained sputum; and (3) a vague deterioration of health, especially in elderly patients. The most important step in early diagnosis is to think of the disease. This is true particularly since lung carcinoma is a comparatively newcomer, and doctors trained 20 or more years ago were not brought up to be cancer-of-the-lung minded.

The most important confirmatory procedures are roentgenography, bronchoscopy, and cytologic examination of the sputum. (Cytologic examination of the mucus obtained at bronchoscopic examination has been found to yield accurate diagnoses in as many as 60 per cent of the cases in some clinics in the United States of America). Thoracotomy is the last logical examination and should be used when needed to establish the diagnosis as well as to assess the operability.

The operation recommended is block-dissection pneumonectomy. In this, the pericardial sac surrounding the hilar structure is removed with the lung, with complete block dissection of all the accessible mediastinal glands from the superior thoracic inlet down to the level of the diaphragm. Lobectomy may be used in properly selected cases, i.e., elderly patients with a peripheral type of growth in whom the hilum appears clear.

In 666 cases seen from 1941 to 1947, the average operability was 11 per cent. Operability has increased to 16.5 per cent during the past 3 years.

In 101 operations, of which 15 were lobectomies, the operative mortality was 18 per cent (The collected operative mortality from 7 leading clinics in the United States and England varies from 15 to 32 per cent.)

The 5 year survival rate thus far is 8 per cent, with 47 patients still alive and well for periods of from under 1 to 3 years.

Twenty-eight patients have died since operation, 3 of causes other than recurrence. It is believed that many of these obtained great benefit from operation since a number enjoyed a useful extra life span, and in many cases death came in a kinder form than would have been the case with an untreated tumor.

FRANK B. QUEEN, M.D.

HEART AND PERICARDIUM

Closure of Defects in Cardiac Septa. GORDON MURRAY. *Ann. Surg.*, 1948, 128: 843.

The cardiac septal defects present a challenge to the surgeon. Attempts at closure, at least in part, have been carried out experimentally and in clinical patients and have resulted in moderate improvement.

In about 30 animals the authors passed sutures through in the line of the interauricular septum beginning at the site of the transverse sinus behind the aorta, and coming out posteriorly between the superior vena cava and the right pulmonary veins. With two, three, or four sutures passed through in this way, pulled taut, tied together posteriorly, and then tied anteriorly, it was possible to compress the anterior to the posterior wall of the auricle in such a way as to occlude the defect completely. There was also the advantage of diminishing the size of the enlarged auricles. On examinations of the specimens, the anterior wall of the auricles had healed to the posterior wall in such a way as to cause complete occlusion of the defect and construction of what appeared to be another interauricular septum.

This would suggest further work which might go on to produce better effects anatomically and clinically. The demonstration that this can be done with safety is probably the chief feature of the present work.

JOHN J. MALONEY, M.D.

Surgery of the Heart. B. NOLAND CARTER. *J. Am. M. Ass.*, 1948, 138: 1207.

The author describes the surgical treatment of several cardiac conditions. Surgical therapy of heart disease in cases which have heretofore been considered hopeless is changing the prognosis.

Acute suppurative pericarditis. Penicillin and surgical drainage offer the best prognosis for this condition. Early operation is important, and the most common approach is the anterior one. Drainage tubes, irrigation, or both are used. Chemotherapy has been disappointing. The objections to pericardial paracentesis are (1) danger of injury to the heart, and (2) inadequate drainage.

Chronic constrictive pericarditis. Although medical treatment is often palliative, it is never curative. While the inflammatory process is active surgery is unwise. Technically, few changes have been made. A portion of the thickened pericardium is removed by either the extrapleural or the intrapleural approach. Early diagnosis is important because of atrophy from disuse and myocardial degeneration in long-standing cases.

Coronary sclerosis. The production of an adequate collateral circulation is the basis of surgical treatment in these cases. Some methods are (1) scarification of opposing surfaces, (2) use of irritating substances (talc, asbestos, and acriflavine), (3) use of pectoral muscle flaps, and (4) anastomosis of the aorta to the coronary sinus with a transplanted vessel. Pericoronary neurectomy has been used in an attempt to relieve anginal pain. The author has modified the work of Lezius in using the lung as a source of blood supply. The author points out the difficulty in evaluating clinical results because of the different methods used and the limited material.

Nonpenetrating wounds of the heart. Damage varies from actual rupture to mild contusion. Signs and symptoms are frequently masked by evident injury to the bony thorax. Findings are precordial pain, tachycardia, arrhythmia, dyspnea, and roentgenologic and electrocardiographic changes. Surgical intervention is indicated (1) when a small rupture

of the artery occurs with hemorrhage and cardiac compression, (2) when there is cardiac compression from blood originating from sources other than rupture of the heart, and (3) when softening and fibrosis result in the formation of an aneurysm.

Penetrating wounds of the heart. Not all patients sustaining penetrating heart wounds need be subjected to operation (wounds from ice picks, small-bladed knives, and long pins). In larger wounds, surgery is indicated. Aspiration is performed in selected cases only when the operating room is prepared for surgery.

Retained foreign bodies. The recent war has focused more attention on this subject. Harken has pointed out that foreign bodies measuring 1 cm. or more in two dimensions should be removed surgically. Surgery is performed (1) to prevent embolism, (2) to diminish the danger of bacterial endocarditis, and (3) to decrease the incidence of myocardial damage.

Patent ductus arteriosus. Surgery in this field has served to limit complications of the condition and improve the prognosis in these cases. Complete division of the ductus seems to be the procedure of choice. It is pointed out that the operation has a curative value in the presence of subacute bacterial endarteritis, whereas at one time this complication was considered a contraindication.

Coarctation of the aorta. The most important sign is hypertension in the upper portion of the body with hypotension in the lower. Additional signs are cardiac hypertrophy, scalloping of the ribs, absence of the aortic knob, and palpable pulsating arteries on the thoracic wall. Resection on the coarcted portion with end-to-end suture is the treatment of choice.

Tetralogy of Fallot. A surgical attack is made for the relief of pulmonic stenosis, although each vessel arising from the aortic arch has been utilized for anastomosis. Blalock prefers the innominate subclavian artery because of the better angle it makes when anastomosed. The results in patients who survive have been phenomenal. Side-to-side anastomosis between the aorta and either pulmonary artery has been used. ROBERT E. FLORER, M.D.

The Surgical reatment of Mitral Stenosis. Valvuloplasty. DWIGHT E. HARKEN, LAURENCE B. ELLIS, PAUL F. WARE, and LEONA R. NORMAN. *N. England J. M.*, 1948, 239: 801.

Numerous complex physiologic and morphologic factors are concerned in the production of symptoms in patients with mitral stenosis.

A preliminary classification is presented of patients incapacitated by mitral stenosis, who may be benefited by different types of surgery: group A, patients with a low fixed cardiac output—mitral valvuloplasty; group B, patients with normal cardiac output—artificial interatrial shunt; and group C, patients with uncontrollable tachycardia or with anginal pain—cardiac denervation.

Five operations have been performed. Mitral valvuloplasty was performed in 2 patients of group A, with 1 death. Artificial interatrial defects were produced in 2 patients of group B, with survival in each case. Denervation of the heart by bilateral removal of the inferior cervical and dorsal first to fourth ganglions in 1 patient of group C was followed by improvement.

These cases are now reported only to indicate the ability of such patients to withstand operation. The evaluation of any long term benefits attributable to these procedures—and, indeed, of the ultimate position of surgery in mitral stenosis—must rest on objective criteria gained from hemodynamic studies carried out before and after operation. Subjective selection of patients and assessment of results lead to dangerous competitive exercises in surgical techniques rather than to advances in therapy.

Four principles of the surgery of mitral stenosis have been evolved: the operation should be performed without dislocation of the heart from the position of optimum function; the buttonhole opening of the stenotic mitral valve should be approached from the auricular side so that the funnel directs the cutting instrument toward the leaflet margin; surgical enlargement of the stenotic orifice should be so planned that there is a minimum burden from associated regurgitation (selective insufficiency) and maximum restoration of valvular function (valvuloplasty); and in the presence of mitral obstruction or regurgitation, undue acceleration of the heart rate must be prevented—tachycardia increases pulmonary vascular pressure and is associated with attacks of pulmonary edema and other forms of "pulmonary decompensation."

An unsuccessful attempt at producing "selective insufficiency" is presented. It is suggested that tachycardia was an important factor in the disastrous outcome.

A case report is presented of a patient with mitral stenosis who survived following an operation designed to produce "selective insufficiency" and "valvuloplasty" of the mitral valve.

The need for more extensive and more effective valvuloplastic techniques is pointed out.

JOHN J. MALONEY, M.D.

Chronic Constrictive Pericarditis. A Study of 53 Cases. PAUL OGLESBY, BENJAMIN CASTLEMAN, and PAUL D. WHITE. *Am. J. M. Sc.*, 1948, 216: 361.

The case histories of 53 patients with chronic constrictive pericarditis seen at the Massachusetts General Hospital, Boston, since 1914 are analyzed with respect to the clinical picture and the long term results of surgery. Exertional dyspnea was the most common symptom and was followed in incidence by swelling of the ankles and legs, abdominal swelling, and abdominal discomfort. The most common physical findings were, in order of their frequency, hepatomegaly, prominence of the neck veins, ascites, peripheral edema, and signs of fluid and/or pleural thickening at the lung bases.

Cardiac enlargement as determined by roentgen films was present in slightly more than 50 per cent

of the cases, and by fluoroscopy the cardiac pulsations were found to be diminished or absent in 32 of the 40 patients so studied. Evidence of unilateral or bilateral hydrothorax and calcification of the pericardium were observed in about equal numbers, in slightly over 50 per cent of the cases.

Surgical exploration with pericardiolysis and partial pericardiectomy was undertaken in 42 patients, 5 of whom were operated upon twice because of failure of the first procedure to improve their clinical status satisfactorily. One patient has been operated upon 3 times. Fifteen of the 42 patients have been essentially cured of their symptoms by operation. There is unquestionable evidence that surgery benefited 10 other patients, 8 of whom are still living, while 2 died 6 years following pericardiectomy. Satisfactory or excellent results have thus been obtained in 60 per cent of the patients coming to operation. Of the remaining 16 patients, 6 died as a result of the operative procedure itself, 5 died from complicating diseases, and 4 died from the effects of their underlying disease.

The etiology was entirely obscure in 30 cases despite the fact that sections of the pericardium were available for microscopic study in 46 of the 53 cases in the series. Tuberculous involvement of the pericardium was proved in 9 patients. Healed fibrous scarring was the usual finding which may or may not have resulted from tuberculous infection.

From the pathological study of the autopsy material it is suggested that removal of the anterior or anterolateral portions of the pericardium alone may be inadequate to release auricular and ventricular action completely. Also, the friable and sometimes calcified nature of the myocardium may explain some of the poor operative results. The possibility has also arisen that the formation of scar tissue over the defect in the pericardium resulting from the partial pericardiectomy might reproduce the same constriction of the heart that was present prior to operation. Persistence of an active inflammatory process may also explain some of the poor surgical results. ORVILLE F. GRIMES, M.D.

Constrictive Pericarditis with Obstruction of the Pulmonary Veins. WALTER LAWRENCE, JR., W. E. ADAMS, and DONALD E. CASSELS. *J. Thorac. Surg.*, 1948, 17: 832.

A case of chronic constrictive pericarditis followed from incipiency to termination is reported, in which the cause for failure of surgical treatment was not disclosed until postmortem examination was performed.

In early 1946 a 14-year-old boy was admitted because of abdominal swelling, ankle edema, and dyspnea. The diagnostic work-up led to the opinion that his malady was produced by a mediastinal mass impinging upon and obstructing the pulmonary circulation. Such a mass was demonstrated by a chest roentgenogram.

At operation, considerable evidence of pleural and mediastinal inflammatory change of a chronic sort was encountered, but a 2 by 2.5 inch tumor, classified as a cavernous hemangioma, was removed from the mediastinum in the region of the pulmonary conus. Immediate improvement was noted when the mass was removed. This improvement was short-lived, however, the venous pressure remaining elevated. Fluid persisted in recurring in the pleural and peritoneal cavities. Cardiac movements were restricted and fluid was aspirated from the pericardium.

Approximately 1 month after the first operation, a decompression of the pericardium was carried out. This sac contained considerable hemorrhagic fluid, but no adhesions were recognized within the space.

Improvement was again noted, but 4 months later evidence of a constrictive pericarditis was present and an extensive decortication was performed. Little or no improvement followed this and the patient succumbed some days thereafter.

The autopsy revealed the failure of successful cardiac decompression to be due to cardiac failure induced by extreme cicatricial narrowing of the pulmonary veins.

The progressive character of an inflammatory lesion of the mediastinum nullified attempts at surgical release of cardiac constriction. The presence of a mediastinal tumor contributed to this result. Such a combination is unusual, of course, but it did permit this case of chronic constrictive pericarditis to be followed throughout its entire course. The constricting effect on the pulmonary veins was also a very unusual feature. The etiology of the inflammatory process could not be determined.

In 6 of 7 other patients with constrictive pericarditis who were treated, the results were satisfactory even though 2 required reoperation. In the seventh patient the condition was of tuberculous etiology and terminated fatally, this being the only case in which a definite etiology could be determined.

HIRAM T. LANGSTON, M.D.

Operation of a Stenosis of the Aortic Isthmus 6 cm. in Length (Opération d'une sténose de l'isthme de l'aorte d'une longueur de 6 centimètres). I. BOEREMA. *Presse méd.*, 1949, No. 2: 39.

Congenital stenosis of the aortic isthmus presents a characteristic picture. There is marked hypertension in the aortic arch and its branches to the head and arms, causing frequent headaches and nausea. At the same time, there is hypotension and poor circulation in the lower half of the body. The patients complain of coldness in the legs, fatigue on walking; even intermittent claudication is observed. Pulsation is absent in the femoral and popliteal arteries.

The prognosis in patients not subjected to operation is poor. Most of them die during childhood or adolescence, either of rupture of the aorta, of heart failure, or of cerebral hemorrhage. Even the majority of those who reach adulthood die before the age of 40. Because of the immobility of the aorta, resection of the stenosis and end-to-end suture is possible only if the stenosis does not surpass the length of 2 cm.

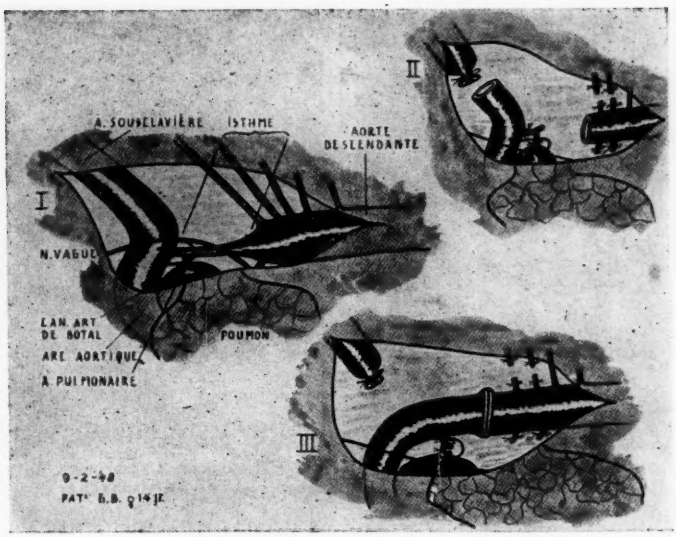

Fig. 1 (Boerema).

In the first case a girl of 14 years, in whom the correct diagnosis was made soon after birth, complained of headache, nausea, chest pain, pain in the calves after walking, and dyspnea. The blood pressure in the arm was 150/105, there was no pulsation of the femoral and popliteal arteries, and the arteries of the foot could be demonstrated by oscillometric examination. Operation revealed stenosis of the isthmus of 6 centimeters' length. The left subclavian artery was very much dilated and appeared like a continuation of the aortic arch. As direct union of the aorta was impossible because of the length of the stenosis, the subclavian artery was ligated and, after resection of the stenosis, was joined to the descending aorta by end-to-end suture.

The operation was a complete success. Two weeks after surgery, the blood pressure in the arm was 135/90 and the pulse was present in the dorsalis pedis artery. The symptoms of headache, pain on walking, and the dyspnea had disappeared completely. WERNER M. SOLMITZ, M.D.

The Surgical Treatment and the Physiopathology of Coarctation of the Aorta. R. J. BING, J. C. HANDELSMAN, J. A. CAMPBELL, H. E. GRISWOLD, and ALFRED BLALOCK. *Ann. Surg.*, 1948, 128: 803.

Twenty-three patients with coarctation of the thoracic aorta were operated upon. Thirteen of the patients were 20 years of age or more, while 10 were younger. An anastomosis was completed in 21 cases of the 22 in which it was attempted. In 17 cases the stenosis was resected and an anastomosis of the proximal and distal ends of the aorta was performed. In 4 cases in which the proximal segment of the aorta was too short for end-to-end suture, the left subclavian artery was used to by-pass the stenosis. There were 3 deaths in the series, including 1 in a child who had multiple congenital defects which had been recognized preoperatively.

Physiologic investigations disclosed no significant deviation of the cardiac output from normal. Blood flow through the arm, which was elevated before operation, fell during surgery. The blood flow through the leg rose postoperatively. Hypertension in the upper part of the body and hypotension in the legs were observed preoperatively. After operation, these pressures tended to equalize. Analysis of the physiologic data indicated no generalized elevation of peripheral vascular resistance. It is probable, therefore, that the hypertension in coarctation of the aorta is not attributable to a renal pressor mechanism, but is due to the resistance of the stenosis and collaterals. JOHN J. MALONEY, M.D

ESOPHAGUS AND MEDIASTINUM

Benign Stricture of the Esophagus. EDWARD B. BENEDICT and RICHARD H. SWEET. *Gastroenterology*, 1948, 11: 618.

In an attempt to standardize the treatment of benign stricture of the esophagus, the authors have reviewed 60 cases of stricture. Clinically, all of the cases presented varying degrees of esophagitis, and many of the strictures were associated with other conditions, such as hiatus hernia, esophageal ulcer, and duodenal ulcer.

Once the differential diagnosis is established by roentgenography and biopsy examination has ruled

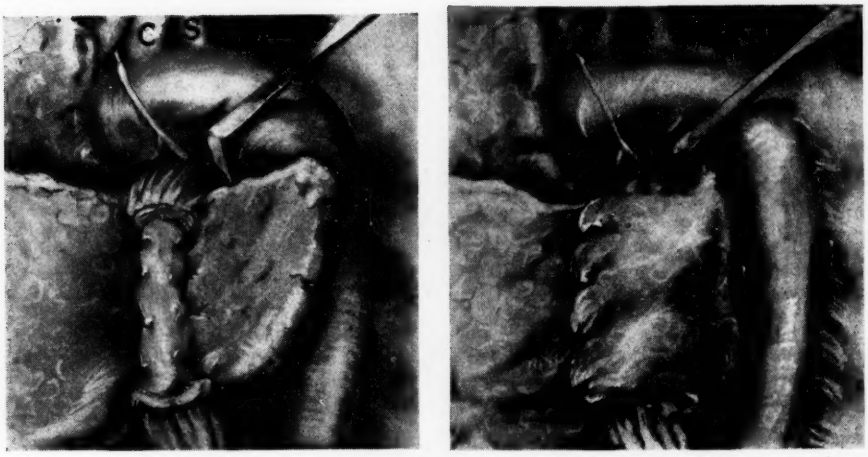

Fig. 1 (Nissen). Sketch of the operative procedure. The denuded portion of the esophagus is covered by a pedicled flap of the upper segment of the lower lobe of the left lung.

out carcinoma of the esophagus (which is equally common in the older age group as is stricture) bougienage with dietary treatment was found to give satisfactory results in more than 60 per cent of the cases. Only if repeated bougienage fails is surgery indicated in the patient who is a good risk. Because of the inflammatory nature of the disease and the length of the stricture, plastic repair is difficult and unpromising. In most cases, therefore, the operation of choice is resection. JANE C. MACMILLAN, M.D.

Bridging of Esophageal Defect by Pedicled Flap of Lung Tissue. RUDOLPH NISSEN. *Ann. Surg.*, 1949, 129: 142.

Grafts of lung tissue have been widely used for reinforcing sutures of the bronchial stump following lobectomy and pneumonectomy. In lobectomy, which is performed for benign lesions as a rule, preference is given to a pedicled flap. In pneumonectomy in which the high level of bronchus dissection does not permit preservation of a pedicled flap, Churchill was successful in securing bronchial closure with a free graft of lung tissue taken from the periphery of the excised lung.

A case history is given in detail in which a leiomyoma of the thoracic esophagus was removed and a pedicled flap of lung tissue was used to protect the critical area in exactly the same way as omental grafts are used in abdominal surgery. The illustrations show the technique of the procedure.

JOHN J. MALONEY, M.D.

Carcinoma of the Superior Mediastinal Segment of the Esophagus. RICHARD H. SWEET. *Surgery*, 1948, 24: 929.

Up to the present time no satisfactory technique for the removal of a lesion located in the upper fourth of the thoracic portion of the esophagus has been developed. Recently a modification of the technique used for the removal of tumors in the midthoracic segment of the esophagus has been proposed. Now, a growth situated in the superior mediastinal segment can be resected and a primary esophagogastric anastomosis with the short proximal esophageal stump can be made in the neck.

The technique involves dissection of the esophagus and mobilization of the stomach as the first phase of the procedure. The dissection is begun in the region of the tumor after the mediastinal pleura is incised above the aortic arch behind the left subclavian artery. If the tumor-bearing portion of the esophagus can be freed sufficiently to make it possible to perform a resection, the operation is continued by completing the dissection of the entire length of the esophagus within the thorax. The mobilization of the stomach is then accomplished and the integrity of the vascular arches along the lesser curvatures is preserved at all cost. The stomach is drawn into the left thoracic cavity behind the hilum of the lung and lateral to the aortic arch. Fixation is accomplished by a series of interrupted silk sutures. The diaphragm is sutured to the stomach just above the pylorus and the diaphragmatic incision is then closed.

The intracervical esophagogastric anastomosis is then accomplished as a second step in the procedure. The esophagus is pulled up from the mediastinum and out in front of the carotid sheath. The fundus of the stomach is brought forward medial to the apex of the lung and pulled up into the lower portion of the neck (Figs. 1 and 2.)

Here the anastomosis is done with careful approximation of the mucosa to mucosa and muscle edge to muscle.

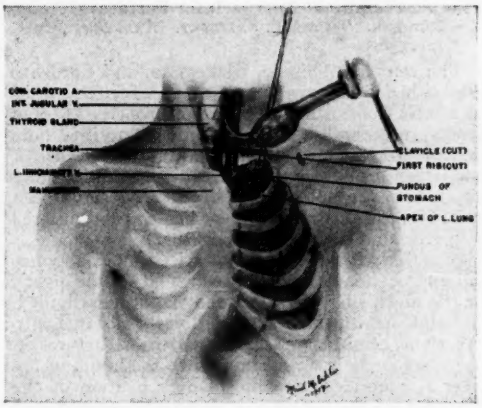

Fig. 1 (Sweet). Drawing to illustrate the method of bringing the fundus of the stomach from the apex of the left pleural cavity into the neck through an opening produced by resecting the medial half of the clavicle and of the first rib.

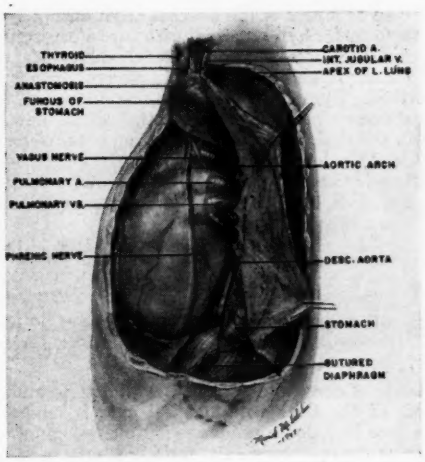

Fig. 2 (Sweet). Drawing to show the relations of the stomach to the thoracic viscera and the structures in the base of the neck. Note: (1) The stomach passes behind the hilum of the lung and extends forward in the apex of the left pleural cavity medial to the lung; (2) at the completion of the operation the anastomosis is on the posterior surface of the fundus of the stomach and lies anterior to the carotid artery and jugular vein.

The author reports a case, giving a detailed description of the method employed. The result was most encouraging. The patient was able to swallow normally and to eat a normal diet.

From the standpoint of long time survival, it is conceded that only the accumulation of experience and the use of the procedure in a large group of patients will prove its value. The probability of local recurrence is great because of the fact that the dissection must of necessity be carried out close to the diseased area. This fault, however, is characteristic of all resections of the esophagus except those near the cardia. It is contended that the relief from dysphagia and the assurance of the comfort of normal eating are benefits which can be expected in the majority of patients and make the procedure well worth the risk. STEPHEN A. ZIEMAN, M.D.

Traumatic Chylothorax. ROBERT R. BALDRIDGE and ROBERT V. LEWIS. *Ann. Surg.*, 1948, 128: 1056.

The actual mechanism of the development of chylothorax following injury to the thoracic duct is not clear, since anatomically the duct is extrapleural in position and chylothorax is an accumulation of chyle in the pleural cavity. Some believe that chyle can escape into the pleural cavity through an uninjured pleural layer, while others believe that a perforation of the pleura is always present, though unrecognized. Retropleural accumulations of chyle have been reported, and it is probable that the usual delay which occurs between injury and the development of chylothorax represents the time required for erosion of the contiguous pleura, and perforation of an enlarging chyloma into the pleural cavity.

Traumatic chylothorax is more common on the right than on the left side, except in cases of penetrating injuries. As a general rule, injuries low in the thorax result in right chylothorax and high injuries in left chylothorax.

The immediate effects of chylothorax are mechanical in nature: (1) a time interval of 2 to 10 days; (2) sudden dyspnea; (3) shock; (4) rapid relief after thoracentesis; and (5) reaccumulation of fluid and recurrence of symptoms.

The secondary effects result from persistent loss of fluid, protein, fat, and lymphocytes: (1) loss of weight; (2) dehydration; (3) reduction in serum protein and body protein; (4) reduction in blood and tissue fat; (5) disappearance of lymphocytes and eosinophiles from the circulating blood; (6) inanition, oliguria, thirst; and (7) death.

The patient may live for a few days to a few months, depending upon the extent of the injury and the complications of the original trauma. The mortality rate approximates 50 per cent.

The accepted treatment of chylothorax has as its aims: (1) reduction of the volume of chyle, and the prevention of respiratory and vascular collapse from intrapleural pressure; (2) maintenance of nutrition; and (3) measures designed to favor healing of the duct; but none of the measures hitherto used is eminently successful.

It has been abundantly demonstrated that the integrity of the thoracic duct is not essential to life. When a patient with an injured duct presents a progressive downhill course, therefore, and conservative methods fail, surgical ligation of the duct would appear to be the only logical therapeutic procedure.

A case of injury of the cisterna chyli during sympathectomy for hypertension, with cure of the resulting chylothorax by ligation of the thoracic duct, the cisterna chyli, and all of its main afferent trunks, is described. Lymphaticovenous anastomoses within the abdomen are adequate for the return flow of lymph and chyle following obliteration of the cisterna chyli and the lower thoracic duct.

When indicated, ligation of the thoracic duct or cisterna chyli, or both, is feasible, and may in some cases be a life-saving procedure.

SAMUEL KAHN, M.D.

MISCELLANEOUS

Strangulating Diaphragmatic Hernia of the Liver. SAMUEL A. WOLFSON and ALFRED GOLDMAN. *Surgery*, 1948, 24: 846.

A case of congenital, strangulated, diaphragmatic hernia of the liver with surgical cure is reported. This case included a unique symptomatology of attacks of nausea, vomiting, and epigastric pain described as "cloudlike" with radiation to both lower, lateral thoracic areas. A "doorstep" feeling on bending forward was a prominent feature of the symptomatology. These symptoms probably have a causal relationship to the strangulation of the herniated liver; and with the surgical reduction of the hernia the patient experienced both a complete and lasting cure.

When a mass is demonstrated roentgenologically in the pericardiodiaphragmatic sulcus, herniation of the liver should be considered as well as the more common lesions. If abdominal symptoms of the type described are present, it is reasonable to suspect strangulation of the herniated liver, and exploratory thoracotomy should be advised.

JOHN J. MALONEY, M.D.

Thoracoabdominal Approach for Portacaval Anastomosis. VICTOR P. SATINSKY. *Ann. Surg.*, 1948, 128: 938.

The work of Whipple, Blakemore, and Lord has established portacaval shunt as an effective means of treating portal hypertension in properly selected cases. In general, a portacaval anastomosis is more desirable than a splenorenal anastomosis because of the larger size of the shunt in the former. In many cases, however, splenorenal anastomoses have been done because of the technical difficulties encountered in performing the portacaval shunt.

A new right-sided transthoracic, thoracoabdominal approach is described in which either the eighth or the ninth rib is resected, the diaphragm divided, the abdomen opened, and the liver dislocated into the right hemithorax. Access to the structures in the gastrohepatic omentum and to the hilum of the liver is simplified, enabling a high ligation of the branches of the portal vein from its lateral aspect and thus affording a longer segment of vein for anastomosis to the vena cava. Exposure is wide and all structures are presented more superficially than when the patient is on his back. Postoperative ileus is reduced to a minimum and little chance for postoperative incisional hernia exists.

Experiments on 6 dogs were carried out as a preliminary step, and a 45 year old male patient with cirrhosis of the liver then had a portacaval anastomosis successfully performed by this approach, using a one-layer Blalock type of intima-to-intima suture with No. 5-0 braided silk. Heparin was not used postoperatively

The suggestion is made that this route be used in the performance of reconstructive surgery of the common duct in cases in which the injury is close to the hilum of the liver, and for operations on the right adrenal gland.

JESSE E. THOMPSON, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Abdominal Wound Closure in the Substandard Patient. MILTON W. DURHAM and JOEL W. BAKER. *Bull. Mason Clinic,* 1947, 1: 4.

A new technique of abdominal wound closure is described which has been found to be especially beneficial in certain groups of patients, including (1) those with disturbed healing capacity (as attested by a lowered serum protein value or a reversal of the A-G ratio), anemia, or reduced blood volume and reduced vitamin values; (2) those with wounds which are actually or potentially infected; and (3) those with wounds made through previous incision scars. Chronically debilitated patients, those with malignancy, weight loss, and impaired hepatic or renal function, patients with peptic ulcer (particularly those with obstruction), and all those with intestinal anastomoses, including gastric and colon resections, require special attention to wound closure, to forestall disruption or postoperative hernia.

Particular advantages of the technique include the minimal reaction to the steel sutures which allows them to remain a considerable length of time with negligible skin reaction, and broad splinting of the wound which allows immobilization of the part but early ambulation of the patient. Closure of abdominal wounds of the type described was performed in 100 consecutive cases following, for the greater part, colon and gastric resections, without wound disruption or postoperative hernia. As a rule the technique is accomplished on paramedian rectus retracting incisions with the peritoneum and posterior rectus sheath in the upper abdomen, or the peritoneum alone in the lower abdomen, with a running suture of 0 or 00 chromic catgut, since a continuous suture results in a smoother intra-abdominal wound and allows less space between sutures through which a hernia might develop.

The remaining closure is carried out as shown in Figure 1, with No. 30 steel sutures which are allowed to remain in place 21 days, and up to 35 days on occasion, according to the degree of healing. The final result with the sutures tied and demonstrating a strong wound support is shown in Figure 2. The sutures are easily removed by cutting the steel on the side opposite the knot next to the skin and pulling the knot with a hemostat.

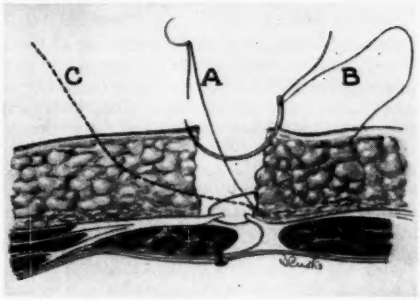

Fig. 1

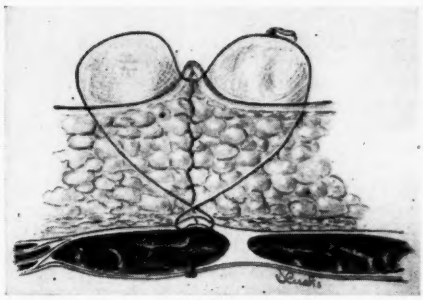

Fig. 2

Fig. 1 (Durham, Baker). Strand A sutured through the anterior rectus sheath with Mayo needle 0.5 cm. from the edge of the rectus sheath; strand B sutured through skin from 2.5 to 3.0 cm. from the skin edge, then mattressed back through both skin margins 0.3 cm. from the incisional margin with large curved cutting needle and back through the skin margin to become strand C. The sutures are placed 1 cm. apart and then tied over rolls of gauze 2.5 cm. in diameter and the same length as the incision.

Fig. 2. Cross section of the incision after suture is snugly tied over the roll of gauze. A thin gauze dressing is then placed over the wound and the wound is sealed with vertical strips of wide adhesive tape.

The Costal Arch Resection. A Substitute for the Transthoracic Approach to Upper Abdominal Pathology. L. P. GAMBEE and ANTHONY INGALA. *West. J. Surg.,* 1948, 56: 605.

The authors believe that requisite exposure of viscera lying high in the abdomen can be obtained via an abdominal incision without extension into the thorax. The incision which has been developed and offered to supplant the combined abdominothoracic approach is one transecting the recti and augmented by its extension over the costal arch and excision of the arch. The incision is physiological in that motor innervation is preserved and that the incision parallels the lines of abdominal stress. Exposure has been consistently abundant and has expedited the accomplishment of the primary surgical objective, thereby offsetting the added minutes consumed in opening and closing this incision. Closure has been completed easily without tension, with the patient slightly jack-knifed. Healing has been most satisfactory and postoperative complications few.

JOHN J. MALONEY, M.D.

GASTROINTESTINAL TRACT

Intraperitoneal Injury of Hollow Viscera Due to Nonpenetrating Wounds. CHARLES A. REIFSCHNEIDER and ERWIN R. JENNINGS. *South. M. J.* 1948, 41: 888.

Intra-abdominal trauma presents one of the most difficult problems with which a surgeon has to deal. Injuries to the hollow viscera may be caused by penetrating wounds or may be due to nonpenetrating injuries from blunt force. Of the two, the latter variety offers more difficult problems in diagnosis. The trauma to the hollow viscus may act in different ways. A severe blow may rupture any portion of the gastrointestinal tract. If the intestines are ruptured, the tear is most likely to occur near the ligament of Treitz or near the ileocecal junction. The intestine may be torn from its mesentery, may be crushed between the abdominal wall and the spinal column, or may be punctured by a spicule of bone from a fracture of the pelvis.

When a patient with a suspected intra-abdominal injury is admitted to the hospital, he should be watched very carefully. If possible an accurate history should be obtained, especially of the time of the accident, and the character and force of the blow. He should be carefully examined, and his pulse, temperature, respiration, and blood pressure should be recorded every 15 minutes. A specimen of urine should be obtained. If he cannot void he should be catheterized. The urine should be examined for macroscopic and microscopic blood. A rectal examination should also be made. He should be typed immediately for transfusion. If possible a flat x-ray plate of the abdomen should be made, as air under the diaphragm may clinch the diagnosis. A blood count and hematocrit determination should be made. The degree of rigidity of the abdominal muscles should be carefully noted, as well as the percussion note, to determine whether or not there is any free fluid in the peritoneal cavity.

If the pulse rate increases and the blood pressure falls, it usually means active hemorrhage and immediate laparotomy is justified. If the patient gives a history of injury to his abdomen, he should be kept under observation for at least 6 hours. This is just as important as the period of observation given to head injuries. A patient should not be discharged from the accident department while still complaining of abdominal pain.

Nonpenetrating rupture of the stomach is rather uncommon. There are no distinctive symptoms or signs of gastric rupture. Excruciating pain is present if the gastric contents are spilled into the peritoneal cavity. This is accompanied by marked tenderness and boardlike rigidity of the upper abdomen. Nausea and vomiting are usually present. The vomitus may or may not contain blood. Symptoms of shock appear early. A flat roentgenogram of the abdomen may show air under the diaphragm.

Rupture of the small intestines due to a nonpenetrating wound is usually single, but it may be multiple. It is most likely to occur at or near one of the fixed points, such as the ligament of Treitz or the ileocecal junction.

Early diagnosis is of great importance. If the operation is delayed more than 6 hours the patient's chance of recovery is greatly decreased. If 12 or more hours have elapsed between the accident and the operation, the prognosis is very bad. If the operation is delayed 24 hours or more, the result is usually fatal.

The patient should be treated for shock with plasma, given intravenously. He should be immediately typed for transfusion. The choice of anesthetic is most important. Spinal anesthesia is contraindicated. If the injury is complicated by intrathoracic trauma, the anesthetic setup must be adequate.

The abdomen is usually opened through a right rectus incision. If free blood is found in the peritoneal cavity, the site of injury should be quickly located and the hemorrhage controlled. It should be noted whether any gastric or intestinal contents are mixed with the blood. The spleen and liver should be quickly examined for laceration.

Local suture, instead of an anastomosing operation or resection, should always be done when possible. If a wound in the intestines is repaired, the line of suture should be transverse to the long axis so as to diminish the chance of constriction of the lumen.

It is a known fact that mortality is greatly increased in resection. According to Bailey, resection should be done only: (1) when a section of the intestine has been destroyed; (2) when there are several large perforations within a short distance of one another; and (3) when injuries affecting the mesentery and its vessel endanger the circulation of the intestines.

The existence of traumatic appendicitis is still extremely controversial. In order to make a definite diagnosis of traumatic appendicitis, it would be necessary to find evidence of trauma of the appendix following a blow of the abdomen, such as laceration or hemorrhage of the walls of the appendix or of the mesentery of the appendix. McCarthy and Magrath, of Philadelphia, reported 2 cases of traumatic appendicitis. In 1 case the appendix and appendical mesentery were detached from the cecum. In the other the appendix was detached at its base.

In 1939, Connell, of Denver, in answer to a questionnaire, tabulated 49,604 cases of acute appendicitis. In this series there was a history of trauma in 11 cases only. In 1 case a pin was found in the appendix; in another there was intussusception without internal violence. If these 2 were eliminated, the remaining 9 cases would give a percentage of 0.0018 in which trauma was mentioned as an etiological factor.

Rupture of the large intestines due to a blunt blow is rather rare. The large bowel may be ruptured by a sharp fragment of bone from a fracture of the pelvis or may be torn when air is forced into the rectum by a hose.

A full bladder extends above the symphysis pubis and may be injured by a blow to the lower abdomen. Fracture of the pelvis is not infrequently complicated by a rupture of the bladder. The rupture may be extraperitoneal or intraperitoneal, the latter condition being much more serious. If the intraperitoneal rupture is not recognized and operation is not performed early, a fulminating peritonitis is found. If the rupture is extraperitoneal, marked urinary extravasation may take place.

Physiologic salt solution should be given with great care until the peritonitis is well controlled and normal gastrointestinal function has returned. The administration of salt results in the collection of the sodium at the sites of trauma in the body, which are principally the operative site and the bowel wall. This results in edema at the operative site, and large collections of fluid within the bowel lumen. An excess of saline in the body is exaggerated by the stimulated adrenal glands and results in the retention of sodium. Sodium excess is also accentuated by the usual partial disturbance of kidney efficiency. It must be remembered that blood and plasma contain salt equaling approximately 9 gm. per liter. Thus, adequate daily salt intake, usually considered between 4 and 9 gm., is administered in these agents. Further salt, if needed, may be given.

The use of antibiotics in a diffuse peritonitis due to a perforated viscus is directed toward control of the infectious process often caused by many different organisms which are present.

JOHN E. KIRKPATRICK, M.D.

Gastric Ulcer: A Study of 600 Cases. FRANCES H. SMITH and SARA M. JORDAN. *Gastroenterology*, 1948, 11: 575.

The authors review 600 cases of gastric ulcer, 59 of which were found to be malignant histologically; 12 ulcers were found to be malignant clinically but were not operated upon. They divide these cases into 3 categories: (1) malignant ulcers, (2) benign ulcers which were operated upon, and (3) benign ulcers which were not operated upon, and then they compare the findings in the benign and malignant groups.

The incidence of malignant ulcers was found to be 9.8 per cent, or 59 cases; these were proved histologically. Of these, 54.7 per cent were operated upon within 2 months from the time they were first seen at the Lahey Clinic. Refusal of operation and delayed hospitalization (and the lack of x-ray evidence in 1 case) accounted for delay in operation of from 2 to 4 months. Of 5 patients on whom operation was delayed from 4 to 6 months, 1 did not return for 4 months and 4 had persistence or recurrence of symptoms although the roentgen signs had disappeared. The 10 patients operated upon later than 6 months had had medical treatment in or out of the hospital and were operated upon because of recurrence. Of the 59 ulcers found to be malignant, 33 were resectable. The survival chart for these cases is shown in the following table:

TABLE I.—600 CASES OF GASTRIC ULCER

Analysis of 44 Operated Malignant Ulcers
Survival Period of 33 Resectable Cases

Duration	Cases	
	Number	Per cent
2 years postoperatively	19	57.5
5 years postoperatively*	5	15.1

*1 patient was alive and well nine years after operation for lymphosarcoma.

There were 211 cases of benign gastric ulcers in which operation was done. Three patients were subjected to total gastrectomy and 208 to partial gastrectomy. Table II shows a summary of the indications for operation in these cases.

It should be noted that while some of these patients underwent resection at intervals varying from 2 months to 11.5 years after coming to the Clinic, 66.8 per cent of them were operated on within 2 months after they were first seen at the Lahey Clinic. Of the 211 operated on, 10 died before leaving the hospital; 5, or 2.4 per cent, may be considered to have died as the direct result of the operation, including bronchopneumonia in 1932, peritonitis in 1933, pulmonary embolus in 1935 and 1945, and cachexia in 1936. Table III is an analysis of the postoperative results for 5 years after gastric resection for benign ulcer in 211 cases.

The medically managed ulcers, or those not treated surgically, make up the third category and include 332 patients. There were 2 patients with malignant ulcer (proved by postmortem examination 6 and 23 years after the patients were first seen at the Lahey Clinic); 41 patients could not be followed up; and there were 15 deaths among the 104 cases followed up for less than 2 years. Four of these 15 deaths were due to hemorrhage and 11 were due to other nonrelated coexisting conditions. The cases of recurrence were studied and the recurrences were

TABLE II.—600 CASES OF GASTRIC ULCER

Analysis of 211 Operated Benign Ulcers
Indications for Operation

	Cases	
Diagnosis of carcinoma	15	42.1%
Diagnosis of probable carcinoma	74	
Recurrence	70	33.1%
Obstruction	17	13.7%
Hemorrhage	3	
Intractability	9	
Failure to heal	21	9.9%
Polyp	1	
Planned cholecystectomy (large ulcer incidental finding)	1	

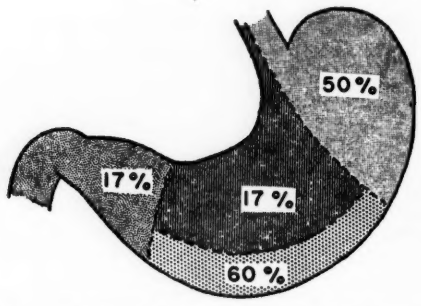

Fig. 1 (Smith, Jordan). The incidence of malignancy in various locations.

attributed largely to dietary indiscretions, and emotional upset or worry.

In comparing the malignant and benign groups it was found that anacidity occurred twice as commonly in the former as in the latter group, but it was observed that hyperacidity is not incompatible with gastric malignancy. Marked weight loss occurs in a much greater percentage of the benign cases than of the malignant ones. The incidence of hemorrhage and obstruction is similar in the two groups, and perforation occurred twice as often in the benign as in the malignant ulcers. The number of cases of coexisting cholelithiasis approximate an incidence identical with that in the general population. The finding of an hourglass stomach in patients with gastric ulcer is interesting because of the preponderance in the malignant group. X-ray deformity of the duodenum is comparable in the benign and malignant groups. Symptoms were similar in both types, except that the patients with benign ulcer tended to have more night pain, and nausea in greater incidence, than those with malignant ulcers.

Gastroscopy was found not at all helpful for diagnosis in 25 per cent of the cases, and in 4.3 per cent of 93 cases a false negative or "benign" impression was obtained on visualization. This is partially accounted for by the high occurrence rate of malignant lesions in spots blind to gastroscopy, as shown on the accompanying diagram.

It should be noted that while the usually estimated incidence of malignant degeneration of an ulcer is 10 per cent, there were only 2 cases in this series known to have become malignant. Assuming that the 4 (follow-up) deaths in the same group were due to cancerous change, the maximum incidence of malignant degeneration was only 5.4 per cent in this series. Even this compares favorably with the hospital mortality of 4.7 per cent and the operative mortality of 2.4 per cent.

There were 20 cases (constituting 3.3 per cent of the total) in which the patient was mistakenly treated for a benign ulcer, and when he was operated upon for recurrence of symptoms a malignancy was found. It is not proved that these ulcers did not degenerate into malignancies during medical treatment, as they well may have done. It is the feeling of the authors that this may have happened in this group in which surgical treatment was delayed. The resection of all recurrent ulcers is advocated even though the resection of some benign ulcers will result.

The criteria of healing ulcers are discussed and evaluated in this paper as follows: the progress of healing (as judged by means of x-rays), the subsidence of the symptoms, and the disappearance of occult blood in the stools, which should all be observed in 3 or 4 weeks, and be complete in from 6 to 8 weeks. Unless the patient follows the medical regimen, and the healing signs are satisfactory, it is believed safer to resect the ulcer early.

JANE C. MACMILLAN, M.D.

TABLE III.—600 CASES OF GASTRIC ULCER

Analysis of Postoperative Symptoms and Signs in 211 Benign Operated Cases

Symptoms and Signs	Duration of Follow-Up					
	Less than 2 years		2 to 5 years		5 years and over	
	Total no.	Per cent	Total no.	Per cent	Total no.	Per cent
Dumping syndrome	6	8.6	3	5.9	2	4.3
Nausea and/or vomiting	10	14.3	4	7.8	3	6.5
Heartburn	5	7.1	3	5.9	2	4.3
Postprandial fullness	4	5.7	6	11.7	2	4.3
Fatigue and weakness	5	7.1	4	7.8	2	4.3
Failure to gain weight	8	11.4	5	9.8	10	21.7
Anemia*	3	4.3	10	19.3	9	19.5
Acid present	4	5.7	6	11.7	2	4.3
Total cases followed	70		51		46	

*Hypochromic or normochromic, mild in all cases.

Subcardiac Gastric Ulcer (L'ulcera gastrica subcardiale). A. CIMINATA. *Gior. ital. chir.*, 1948: 4: 443.

According to the author, who has performed about 1,500 operations on the stomach, 15 per cent of stomach ulcers occur in the subcardiac area. In these cases he doubts the rationale of doing a gastric resection when a simple gastroenterostomy, with its lower mortality, may be sufficient.

In subcardiac ulcer the advisability of doing a gastric resection depends on the amount of gastric tissue available to insure satisfactory suturing. Therefore the extension of a subcardiac ulcer to the esophagus prohibits a resection. When the ulcer involves the posterior wall of the stomach and penetrates the pancreas, the information as to the amount of gastric tissue available for suturing is obtained by by-passing the ulcer. When the author is unable to do so, he follows the advice of Finsterer, i.e., he

performs a gastrostomy, inserts the finger in the stomach, and proceeds to explore the stomach up to the esophagus, thus also obtaining information as to the size of the ulcer.

He advises that enterostats be discarded when a gastric resection is done, a suggestion made first by Tansini in 1923; he stresses the meticulous ligation of the submucous vessels to prevent dehiscence of the sutures and advises ligation of the gastric artery where it courses downward to prevent ischemia of the critical part of the resection. By following this technique he lost only 1 case among the 35 resections he performed for subcardiac ulcer because of dehiscence of the sutures.

The step type of resection is the best one in these cases because it allows resection of the small curvature up to the cardia and removal of the pyloric end which is the ulcer-genetic factor.

JOSEPH M. A. PAPE, M.D.

Gastrojejunal Ulceration. A. G. R. LOWDON. *Edinburgh M. J.*, 1948, 55: 533.

Gastrojejunal ulceration is of peculiar interest and importance for several reasons. It is a man-made disease, a failure of the surgical treatment of ulcer; moreover, it is a serious failure because it is frequently a more troublesome and dangerous condition to the patient than the original complaint. It carries with it the risk of the usual complications of peptic ulcer—hemorrhage and perforation—and, in addition, other complications equally as serious, if not more so. The surgical treatment of gastrojejunal ulcer, often imperative, is difficult and dangerous.

If cases are carefully selected as suitable for the operation of gastroenterostomy, the incidence of gastrojejunal ulcer should be less than 3 per cent. If gastroenterostomy is performed for all cases of duodenal ulcer, irrespective of sex, age, or the degree of stenosis or hyperacidity, the incidence of gastrojejunal ulcer will be 20 per cent or more. The incidence of gastrojejunal ulcer after partial gastrectomy is under 2 per cent.

Preventive treatment of gastrojejunal ulcer must consist primarily in the careful selection of cases for the operation of gastrojejunostomy. It is probably wise to avoid the operation in any patient under 45 years of age unless there are contraindications to the more formidable procedure of partial gastrectomy, and to confine its use to patients in whom the peptic ulcer is associated with some degree of pyloric stenosis and a normal or low acid curve.

Partial gastrectomy has been proved by experience to be a satisfactory treatment of gastrojejunal ulceration. In practice it produces a high percentage of cures. The operative mortality of partial gastrectomy for anastomotic ulcer has, however, been unfortunately high.

Vagotomy is now under trial as an alternative method of reducing the hydrochloric acid secretion. The immediate results of the operation are very gratifying; there is complete relief of ulcer pain and a marked fall in acidity. It is still too early to judge the lasting value of the procedure, but it can, on present evidence, be regarded as the treatment of choice for anastomotic ulcer in elderly or bad risk patients and in all cases of recurrent ulcer after partial gastrectomy.

There are a number of important complications associated with gastrojejunal ulceration. An abscess may develop in the anterior abdominal wall, but this is now rarely seen because the anterior anastomosis is seldom performed. Free perforation into the peritoneal cavity is comparatively common; it occurred in 18 of the 67 patients. It may occur repeatedly. Perforation is usually to be taken as an indication to treat the patient by gastrectomy as soon as he has recovered sufficiently from the primary operation for closure.

Hemorrhage from a gastrojejunal ulcer presents considerable difficulty both in diagnosis and in treatment. The diagnostic problem is to decide whether the hemorrhage is from a stomal ulcer or from a recrudescence of the primary ulcer. Fortunately, hemorrhage from a secondary ulcer is seldom so severe or persistent as it may be when a posterior duodenal ulcer erodes a branch of the gastroduodenal artery.

Gastrojejunocolic fistula is one of the most difficult problems that can confront an abdominal surgeon. The symptoms are very characteristic—diarrhea, vomiting of fecal material, belching of foul gas, and progressive wasting. Pain is frequently absent, or slight.

CHARLES BARON, M.D.

Partial Gastrectomy for Peptic Ulcer. H. W. PORTER. *Edinburgh M. J.*, 1948, 55: 549.

While the final answer to the treatment of chronic peptic ulceration will almost certainly be found in the sphere of the physician, there is at present a considerable proportion of patients who can obtain no permanent alleviation of symptoms from medical treatment, and the majority of these can be greatly benefited, if not completely relieved, by the surgeon.

The disadvantages of partial gastrectomy may be tabulated under the following headings: the operative mortality, anastomotic ulcer, inability to return to normal diet, postoperative dumping syndrome, anemia, inability to return to former employment.

An analysis was made of 118 unselected cases (87 duodenal, 20 gastric, and 11 stomal ulcers).

The indications for operation were repeated perforations (38 cases), hemorrhage (17 cases), and failure to respond to medical treatment (63 cases). Patients who failed to respond were those who had had more than one adequate course of medical treatment in the hospital and were not benefited, or had had a recurrence in spite of adherence to medical treatment after discharge, and (b) people who were unable to continue adequate medical treatment due either to economic factors or low intelligence.

There were 4 deaths, all of which occurred in patients in the 50 to 60 year age group, which may be an argument for instituting surgical treatment at an earlier date.

The postoperative complications were: pulmonary atelectasis in 22 patients, hemorrhage in 7, pulmonary embolus in 1, pneumothorax in 1, obstruction at the stoma in 1, and bowel obstruction in 1; leakage from the duodenal stump did not occur in any of the cases. Several factors contributed to a satisfactory recovery. Prophylactically, they were: (a) the abolition of constricting abdominal binders and dressings; (b) early rising to encourage abdominal breathing; (c) the avoidance of indiscriminate use of gastric suction; (d) encouragement to cough, which not only entails reassuring the patient regarding the ability of his wound to stand the strain of coughing, but may also necessitate personal supervision to make sure that he does cough; (e) the avoidance of respiratory depressant drugs as far as possible, especially morphia (the use of procaine intravenously may prove to be a suitable substitute); (f) the avoidance of postoperative dehydration. In the treatment of collapse, should it occur, the use of penicillin has proved invaluable.

It has been possible to follow up all patients who were operated upon. Three patients have died since their discharge. In 1 of these a gastrojejunocolic fistula developed; in 1, an acute lobar pneumonia developed 9 months later; the third patient had two attacks of acute obstructive jaundice 4 months later and after exploration, which revealed no stone, the jaundice cleared up, but the patient had a flare-up of quiescent pulmonary tuberculosis which proved fatal. All of the remaining patients are alive and well. All but 2 of these have returned to their former employment (84 per cent of these returned in 3 months or under, and 24 per cent returned in 6 weeks or under). Several among the 24 per cent were able to undertake heavy manual work.

Many authors believe that gastrectomy is but one step in the treatment of peptic ulcer, and that it is necessary for patients to continue on a strict ulcer regime after operation. This may be due in part to the fact that the majority of patients who have undergone a large or full length anastomosis cannot eat a full meal. It has been shown that the gastric remnant remains small for a long period after operation —18 months or more— and that after eating there is gross jejunal bulging. One cannot help feeling that any major operative procedure directed at curing the patient must be regarded as a failure unless he can consume a full normal diet and lead a normal life. In this series, no case followed up roentgenologically showed gross jejunal bulging and all showed dilatation of the gastric remnant to 3 or 4 times its original size within 6 weeks of operation. This has enabled 90 per cent of patients to return to a full diet—normal in quantity and quality—within a period of 6 weeks. It is obvious that the psychological effect of being able to eat anything and everything is very great. Finally, the answer to the last question in the follow-up, "Would you advise a close relative to have this operation under similar circumstances?" was unanimously answered in the affirmative.

CHARLES BARON, M.D.

"Palliative Gastrectomy" in Cases of Duodenal Ulcer. IVAR SPAK. *Acta. chir. scand.*, 1948, 97: 91.

The author uses the term "palliative gastrectomy" to describe the operative procedure for duodenal ulcer when the ulcer is left *in situ* but the procedure is otherwise similar to a Billroth II operation. It is the procedure which is more commonly described in the American literature under the term of the Finsterer exclusion operation. The article is based on a comparison of the results of 83 "palliative gastrectomies" with those of 102 radical Billroth II resections with complete removal of the ulcer, the two series comprising all of the cases of duodenal ulcer operated on in the years from 1936 to 1945 with a follow up of at least 1 year.

"Palliative gastrectomy" was performed on all patients with an ulcer penetrating into the pancreas when injury to the pancreas or the gall ducts might be entailed by radical operation. The author emphasizes that a palliative resection must be systematically planned, and that when it is resorted to in an emergency after radical excision has proved impossible, irreparable damage to the blood supply of the pylorus has usually taken place which will result in serious and often fatal leakage from the pyloric stump. In performing this operation the author excises the mucosa of the pyloric stump and invaginates the remaining tissue, taking care to be sufficiently proximal to the pylorus to allow easy invagination.

The comparison of the results in these two large series is of great interest. The mortality for palliative resections was 2 per cent and for the radical operation 5.5 per cent. In the follow up, 91 per cent of the patients who had had a "palliative resection" had a satisfactory result, while 89 per cent of those on whom the complete operation with excision of the ulcer had been performed had satisfactory results. In studying the patients postoperatively the author found no significant difference in the production of acid in the two groups, nor was there any difference in the incidence or severity of postoperative dyspeptic symptoms. In both groups some patients had, in addition, an enteroanastomosis, but no difference in the postoperative course could be found.

The author thus concludes that there is no essential difference between the effects of the two methods of operation, and as the palliative resection in many cases has a lower mortality it should be widely used.

F. J. LESEMANN, JR., M.D.

Gastric Polyps. LEO L. HARDT, FREDERICK STEIGMANN, and GEORGE MILLES. *Gastroenterology*, 1948, 11: 629.

The authors present 62 cases of gastric polyps. The highest incidence occurred in the older age groups, 70 per cent of the patients being in the sixth and seventh decades of life. Of the 62 patients, 72 per cent were males; only 30 per cent were colored people.

Gastroscopic examination of patients with definite gastrointestinal symptoms, but with negative x-ray

findings, often reveals some type of polypoid growth. These growths have, at times, no definite characteristic criteria as to their malignant or benign nature. Most of them, regardless of the later proved diagnosis, had no free acidity on the test meal, and most of them had a normal mucosa, so that deviation from the normal in such patients is without diagnostic significance. A safe method for dealing with polyps of the stomach, therefore, appears to be surgical removal of the lesions. SAMUEL KAHN, M.D.

End Results in the Treatment of Cancer of the Stomach. GEORGE T. PACK and GORDON MCNEER. *Surgery*, 1948, 24: 769.

Gastric cancer is the most common and one of the most rapidly fatal of all cancers. Nevertheless, the hope for cure is a very definite one and is becoming greater as the years go by. The 5 year cure rate for 795 patients treated from 1912 through 1941 was 3.4 per cent. Of 75 patients surviving gastrectomy, 26, or 34.7 per cent, lived 5 years without recurrence.

If more gastric cancers are to be recognized in their early curable stage, strict attention must be paid to the earliest symptoms which are:

1. Simple indigestion in any person of middle or late life.
2. The ulcer syndrome appearing for the first time in a person past 40 years of age. Until proved otherwise, this patient should be considered as having cancer of the stomach.
3. Secondary anemia without known cause.
4. An awareness that all is just not right, or "stomach consciousness." Probably this is the earliest symptom of gastric cancer.

When any of these symptoms occur, GI series and fluoroscopy by a competent radiologist must be done. Only by these means will more gastric cancer be recognized in the early curable stage.

An analysis of 795 patients suffering from gastric cancer and treated in the Memorial Hospital for Cancer and Allied Diseases, New York, from 1916 through 1941, shows a steady increase in operability and resectability, and a steady decrease in operative mortality despite the fact that formerly palliative operations were common while now curative resections are the trend.

The operability of cancer of the stomach has increased steadily through successive 5 year periods, from 51.8 per cent to the present 82.7 per cent, and the resectability (of all cases) from 2.9 per cent to 39.8 per cent, while the operative mortality has decreased from 62.5 per cent to 21.7 per cent. The decrease in mortality has occurred despite the fact that during the past 5 years 42.8 per cent of all gastric resections for cancer were of a major character, i.e., total gastrectomy or transthoracic cardiectomy. In 92 subtotal gastrectomies the operative mortality was but 9.8 per cent.

Other factors which influence the end results are:

Duration of symptoms. The average duration of preoperative symptoms in 66 patients operated on between 1931 and 1941 was 9.7 months. The duration of symptoms for those surviving less than 5 years and those surviving more than 5 years following operation was approximately the same, i.e., 9.9 months and 9.3 months, respectively.

Period	Total cases	Operable cases, per cent	Resectable			Operative mortality, per cent
			Number	Operable cases, per cent	Total per cent	
1916–1930	272	51.8	8	5.7	2.9	62.5
1931–1936	245	60.8	19	12.8	7.7	31.6
1937–1941	278	73.7	76	35.6	26.2	19.2
1942–1946	405	82.7	161	48.1	39.8	21.7

The gross pathological type of cancer. The 5 year survival without recurrence following resection in the various gross types was 22.7 per cent for the annular, 25 per cent for the infiltrating, 26.3 per cent for the polypoid, 33.9 per cent for the ulcerating, and 100 per cent for carcinoma *in situ*. Thus annular carcinomas are the most fatal type, and carcinoma *in situ* is the least fatal.

The presence of metastases in the regional lymph nodes. The influence of metastases to the regional lymph nodes on 5 year survivals was shown by a 24.2 per cent 5 year survival when metastases were present and a 42.8 per cent 5 year survival when they were absent.

Stated differently, of the patients who survived 5 or more years, 69.2 per cent had no lymph node metastases, while among those who had metastases the 5 year survival rate was but 30.8 per cent.

Serosal penetration. Fifty per cent of 16 patients having this complication had a 5 year cure, even though in 6 metastatic cancer was present in the regional lymph nodes.

The microscopic grade. Five year cures were obtained among the various microscopic grades of malignancy as follows: grade 1, 100 per cent; grade 2, 41.7 per cent; grade 3, 30 per cent; and grade 4, 16.7 per cent. Thus, grade 1 cancer is highly curable and grade 4 is far from hopeless.

Gelatinous or mucinous types of cancer have a poor prognosis, probably because the mucin together with the cancer cells permeates the subserosal lymphatics early, and results in diffuse peritoneal carcinosis. Only 2 (21%) of 9 patients with such a cancer lived 5 years after resection, although in 7 there were no metastases in the perigastric lymph nodes.

FRANK B. QUEEN, M.D.

Physiological Aspects of Vagotomy. J. E. THOMAS and S. A. KOMAROV. *Gastroenterology*, 1948, 11: 413.

The authors point out that the striking physiological aspects of vagotomy on experimental animals have aroused the curiosity of investigators for at least the past 300 years. However, the effects of complete severance of the vagus nerves on gastroin-

testinal functions were not adequately observed until Pavlov devised a method for preventing the early death of the experimental animal, which regularly followed vagotomy done through a cervical incision. When the vagus nerves were cut in the neck the animals generally died of asphyxia or aspiration pneumonia, or they starved to death because of disturbances in the swallowing mechanism. By using dogs with a gastric fistula and cutting one of the vagus nerves below the level of the recurrent laryngeal nerve, Pavlov and others learned to circumvent many of the original difficulties.

In animals prepared by Pavlov's technique it was found that gastric digestion was inadequate to cope with the ordinary nutritional requirements of an animal on a normal diet. Food stagnated in the esophagus and stomach, and special precautions were necessary to prevent death of the animal. It was the rule in the Pavlov laboratory that only those animals which failed to secrete acid when sham-fed were considered to have had their gastric vagus fibers completely severed. In 1896 Pavlov, considering his studies and those reported in the literature of the time, concluded that the consequence of complete vagotomy which was most dangerous to life was the impairment of the digestive processes including disturbances of the gastrointestinal motility and the secretory function of the stomach, pancreas, and possibly the intestine. He also emphasized the extreme vulnerability of the intestine.

The authors point out that the exact relation of the vagus nerves to gastrointestinal function is one of the more obscure problems of physiology. At times the vagus nerves appear to initiate functions as do true motor or secretory nerves. At other times they appear merely to augment or inhibit response to local stimuli. Following vagotomy the loss of tonic activity appears to be of major importance in the deterioration of function that follows vagotomy. Although no specific function is lost, the muscle appears to be relaxed and flabby and does not react with normal vigor to such local stimuli as distention of the stomach wall. Doubtless, also, the gland cells are affected in a similar way, but because of the nature of their function the changes are less easily characterized. Not only is the cephalic phase of secretion absent because of loss of vagal innervation but responses to the local stimuli normally producing the gastric and intestinal phases may be feeble or altogether absent.

The authors stress the fact that complete vagotomy in experimental animals regularly causes nutritional disturbances severe enough to cause death of the animal. These changes are characterized by hypomotility of the stomach and hyposecretory function.

The authors review the evidence, both experimental and clinical, and they believe that transthoracic or transabdominal vagotomy is seldom complete and that apparent discrepancies in experimental results can be explained by the differences in the completeness of the vagotomy. They also suggest that the relative harmlessness of this operation in man is due specifically to its incompleteness. Any attempts to accomplish a more nearly complete vagotomy in human subjects is thought to be unwise. The guaranteed severance of all vagal fibers may lead to quite unfavorable results.

EDWARD F. LEWISON, M.D.

Gastrointestinal Motility Following Vagotomy and the Use of Urecholine for the Control of Certain Undesirable Phenomena. THOMAS E. MACHELLA and STANLEY H. LORBER. *Gastroenterology*, 1948, 11: 426.

Changes in gastrointestinal motility may be due to alterations in either the extrinsic or intrinsic innervation. The extrinsic innervation consists of the sympathetic and the parasympathetic systems. The intrinsic innervation consists of at least two plexuses, Auerbach's and Meissner's. The vagus nerves supply parasympathetic innervation to the alimentary tract down to and including the proximal half or third of the transverse colon.

The authors briefly review the experimental and clinical evidence for the alterations in gastrointestinal physiology associated with vagus section, and report (1) cardiospasm, (2) gastric dilatation, hypotonus, and delayed emptying time, and (3) changes in intestinal motility.

This study is based upon 24 patients who have been subjected to vagotomy and upon 2 others who had their vagi interrupted together with resection of the fundus of the stomach and the lower esophagus for a high ulcer. Ten of these patients had no ancillary operative procedure other than vagotomy, while 16 had some form of anastomosis prior to, or simultaneous with, vagotomy.

In studying the effects of vagotomy upon gastrointestinal motility the most common motor disturbance observed by these investigators was gastric retention, and absent or diminished antral peristalsis. The time required for barium to move from the duodenum to the cecum was delayed probably as a result of poor emptying of the stomach.

In one patient, dynamic ileus was noted, and in another, dilatation of the entire small intestine. Motility disturbances secondary to an obstructing duodenal ulcer, to obstruction at or near the site of a gastroenterostomy stoma, or to obstruction of the esophagus at the operative site was observed. Such mechanical obstructive factors are to be kept in mind when symptoms of retention or obstruction are observed following vagotomy. No significant changes in the motility of the colon were noted by the authors. Spontaneous gastric emptying, sufficient to afford relief from symptoms of retention, occurred in all patients in whom the retention was secondary to vagotomy alone, after intervals varying from 2 to 12 months.

The authors discuss their experience in using urecholine for the treatment of postvagotomy complications and emphasize the little known fact that absorption from the small intestine must occur if

oral administration is to be effective. Their routine in using the drug is outlined.

EDWARD F. LEWISON, M. D.

New Observations on the Oral Opaque Enema of the Small Intestine (Nuove osservazioni sul clisma opaco transbuccale del tenue). ANTONIO LURÀ. *Arch. ital. mal. app. diger.*, 1948, 14: 386.

The term "oral opaque enema of the small intestine" is applied by the author to the introduction of an opaque medium through a duodenal tube for the purpose of visualization of the small intestine.

The method allows visualization of the entire small intestine and sometimes also a portion of the large intestine. The advance of the opaque column can be studied.

The method is valuable for the detection of a neoplasm of the small intestine. It is superior to oral administration of an opaque medium because the customary method may yield unsatisfactory results in the presence of a pylorospasm or a partial pyloric obstruction. Also, in the presence of vomiting, direct introduction of a barium suspension into the duodenum is obviously preferable to ingestion of the opaque medium. A vicious circle following gastroenterostomy can be visualized.

JOSEPH K. NARAT, M.D.

A Contribution to the Study of the Arterial Circulation at the Angle of the Duodenum, Jejunum, and the First Intestinal Loop (Contributo allo studio della circolazione arteriosa dell'angolo duodeno digiunale e della prima ansa intestinale). G. OMEGNA and S. NEGRETTI. *Chirurgia*, 1948, 3: 280.

The authors studied the arterial circulation in the region of the ligament of Treitz by injecting the superior mesenteric artery at its origin in 20 cadavers. They describe a branch known as the artery of the duodenojejunal angle which arises from the inferior pancreaticoduodenal artery or from one of its branches. Rarely, it arises from the first intestinal artery. This artery which is small in caliber often constitutes the only blood supply to the first loop of the jejunum. Even when there is an anastomosis with the first intestinal branch the superior portion has fewer collateral vessels than the inferior portion. This causes a deficiency of secondary arches to the superior portion of the first jejunal loop.

The authors wish to stress the value of this finding when gastric surgery is to be done, especially when a gastroenterostomy for marginal ulcer is broken down, and end-to-end anastomosis of the first part of the jejunum is necessary. As one proceeds distally the blood supply becomes better and better. For this reason they recommend that in performing an ordinary gastroenterostomy the jejunal loop should be at least from 7 to 10 cm. in length.

The authors also describe the terminal branches of the vasa recta and the marginal arch of Drummond. They emphasize that the intestine should be opened along its free margin or antemesenteric border in order to conserve the blood supply equally on both sides when a gastrojejunal anastomosis is accomplished. This also makes for better hemostasis. When it is necessary to divide the intestine this should be done at right angles to the long axis of the bowel because the terminal branches follow a perpendicular course and do not anastomose very freely. The section may be oblique, with the mesenteric side longer than the antemesenteric side, but never shorter.

LUCIAN J. FRONDUTI, M.D.

Intussusception in Childhood. ROBERT E. GROSS and PAUL F. WARE. *N. England J. M.*, 1948, 239: 645.

This report covers the diagnosis, treatment, and results of therapy in 610 cases of intussusception, including 372 cases reported by Ladd and Gross in 1934.

Emphasis is placed upon early diagnosis. The authors' statistics show an increase in earlier diagnoses and a lowered mortality for the late cases in the period from 1934 to 1947 as compared to the earlier series.

The etiology remains obscure, mechanical factors (diverticuli, polyps) having been found in only 5.4 per cent of the entire series.

Diagnosis is relatively simple in 9 of 10 cases and can be made on the basis of the sudden onset of paroxysmal pain, vomiting, gross or occult blood in the stool (10 or 12 hours after onset of the pain), and a palpable abdominal mass. Rectal examination with bimanual palpation of the abdomen will increase the number of cases in which an intra-abdominal mass can be felt. When doubt remains a barium enema will confirm the diagnosis in most instances since in from 90 to 95 per cent the colon is involved as the receiving segment of the intestinal tract.

In general, the authors do not feel that reduction by hydrostatic pressure should be attempted because of the delay caused by the procedure, and the possibility of missing a specific mechanical cause or leaving a small bowel or ileoileocolic intussusception incompletely reduced.

Rapid preparation of the child for surgery is accomplished with glucose, plasma, or blood, as indicated, and a right rectus muscle incision is used. The intussusception is reduced by taxis rather than by traction and the viability of the intestine is determined by improvement of color or the occurrence of peristalsis in the involved segment.

If the intussusception is irreducible, or the viability of the bowel in doubt, resection must be done. In addition, when dealing with a very ill patient, resection should be done without any attempt at reduction since the authors believe reduction has a deleterious effect on the patient which may be fatal under these circumstances.

The authors favor the aseptic, Mikulicz resection because of the low mortality (23 per cent) in their series as compared with the mortality when primary anastomoses (83 per cent) or open enterostomies (77 per cent) were done.

Postoperatively, gastric suction and fluid therapy are used and fluids are given as tolerated after 24 hours. If resection has been done, the patient must be very carefully followed up for a longer time and parenteral fluids used to control plasma levels of chloride, protein, and carbon dioxide combining power. From 1946 to 1947 the over-all mortality was 2.7 per cent. With the Mikulicz resection they have had only 1 death in 11 resections in the last 9 years. JOHN H. KAY, M.D.

Anastomosis of the Ileum to the Lower Part of the Rectum and Anus: A Report on Experiences with Ileorectostomy and Ileoproctostomy, with Special Reference to Polyposis. R. RUSSELL BEST. *Arch. Surg.*, 1948, 57: 276.

This article is a report of the author's experiences with anastomosis of the terminal ileum to the lower 4 inches of the rectum and directly to the anus. In this series the operation was done in 5 cases of polyposis with associated malignant degeneration of the rectum and in an additional 4 cases of advanced carcinoma of the rectum without polyposis.

The chief indications for anastomosing the terminal aspect of the ileum to the lower part of the rectum or anus are polyposis of the colon and the rectum when carcinoma has developed in the rectum, and the patient's desire to avoid an ileostomy. At the present time the author does not believe the ileorectostomy or ileoproctostomy should be attempted in routine cases of rectal carcinoma in order to preserve the sphincter mechanism or when it is impossible to bring the sigmoid and rectum into apposition. From the complications which appeared in these cases it would appear that a colostomy should be chosen in preference to attempting to preserve the sphincter mechanism by side-tracking the colon and hooking the terminal ileum to the lower part of the rectum or anus until further refinements of techniques have been developed.

It appears that the best operation in the present series is a telescoping procedure whereby a rectal tube is forced into the ileum and the tube is drawn out through the anus. Interrupted sutures complete the anastomosis. This can be accomplished entirely from within the abdomen or by a combined method of abdominal dissection and posterior anastomosis. Because of the incidence of rather excessive posterior drainage or development of fistula, establishment of posterior drainage of the presacral space is indicated.

Considerable effort must be directed toward decreasing the frequency of bowel movements during the postoperative period. This includes the energetic use of paregoric and milk of bismuth and tannic acid products. A low residue constipating diet is of assistance. After several weeks bowel movement frequency usually stabilizes itself at about 3 to 6 stools during the 24 hours unless a complicating stubborn posterior fistula or stricture develops. This complication results in almost constant posterior drainage.

Hypoproteinemia is rather pronounced during the early weeks postoperatively, but a normal level usually establishes itself after some 3 to 4 weeks, provided efforts toward a high protein intake are made. When the distal part of the ileum is anastomosed to the terminal part of the rectum or anus it becomes dilated, the wall hypertrophies, and the absorptive function and storage capacity apparently increase.

HAROLD LAUFMAN, M.D.

Anemia Following Resection of the Intestine. J. D. MARTIN, JR., ROY L. ROBERTSON, and EDWARD W. DENNIS. *Surgery*, 1948, 24: 819.

Anemia following intestinal resection may be of three types. A normochromic normocytic anemia may occur immediately after operation and is due to blood loss. A secondary hypochromic anemia may occur as a result of nutritional disturbances. A macrocytic hyperchromic anemia may occur as a result of the deficient production or absorption of the erythrocyte maturing factor.

Two cases in which anemia developed following extensive resection of the intestine are discussed. The condition of both patients improved dramatically on folic acid therapy. From a review of the literature it appeared that in both of these patients the anemia was due to faulty or absent absorption or production of substances that ordinarily combat macrocytosis and hyperchromia, namely, the antipernicious anemia factor and vitamin B.

In an attempt to produce a hyperchromic macrocytic anemia in adult dogs, massive resections of the small intestine were performed. Of 12 animals used, only 4 survived a sufficient length of time for study. In these a characteristic sequence of events was observed. At first hemoconcentration occurred because of dehydration from diarrhea and low fluid intake. After adequate fluid intake was resumed approximately normal counts were obtained. However, from 3 to 4 weeks after operation the red cell count and hemoglobin began to drop progressively to low levels. Reticulocytes were extremely rare or absent. Changes in volume and color index were not constant, and no definite trend toward macrocytosis could be established. No response was noted to folic acid therapy, in contrast to the response seen in human beings, and this suggests that the more severe anemia produced in the animal is not entirely due to the same causes as that seen in the clinical cases.

EDWARD W. GIBBS, M.D.

Evaluation of Conservative Resection with End-to-End Anastomosis for Carcinoma of the Rectum and Lower Sigmoid Colon. JESSIE GRAY. *Arch. Surg.*, 1948, 57: 361.

The author's opening paragraph states succinctly the purpose of her report. "This paper is not a crusade for resection of the rectum with restoration of continuity. It is an honest endeavor to assess the place of conservative resection, if any, in the operative therapy of rectal carcinoma. Certain facts are presented, and certain conclusions are drawn. Facts cannot be questioned, but conclusions should be critically assessed."

Seventy-four cases of conservative resection with end-to-end anastomosis for carcinoma of the rectum and rectosigmoid region are reviewed. The operative mortality among these patients was 4 per cent. The expected relationship of survival to stage of the disease was confirmed. Eighty per cent of patients in the group with stage I carcinoma were alive and well, 52 to 59 per cent of those in the groups with stages II and III carcinomas have survived, and only 25 per cent of patients in the group with stage IV carcinomas were alive and well at the time of writing.

The expected relationship of survival to gland involvement was confirmed. Fifty-seven per cent of patients without secondary involvement in glands were alive and well, while only 39 per cent of those with gland involvement have survived.

Results of conservative resection are found to be related to the anatomic level of the tumor in the bowel. Only 17 per cent of the patients whose growths arose below the bottom of the pouch of Douglas have survived. The percentage survival of patients with carcinomas at other levels is found to depend on the stage of the disease and on gland involvement of the tumor. The highest percentage of good results is obtained in growths of upper rectal level. This is attributed to the relative avascularity of this portion of the bowel with resultant slower growth and spread of carcinomas arising at this level.

Unless a carcinoma is definitely polypoid in type and freely movable, resection with preservation of the anal canal should not be undertaken when the growth is readily within reach of the examining finger per rectum.

The development of local recurrence of disease is found to have no special relationship to the stage of disease or gland involvement, but a distinct relationship to anatomic level of the tumor in the bowel. Forty three per cent of the local recurrences have occurred among the patients with carcinomas below the peritoneum, which comprise only 16 per cent of the entire series.

If conservative resection had been reserved for patients whose carcinomas were above the peritoneum, only 3 per cent would have had recurrences which might conceivably have been avoided by total extirpation of the rectum.

Eighty per cent of patients operated on within the 5 years prior to writing were alive and well as compared with only 42 per cent of those with resection done more than 5 years previously. Evidence is brought forth to support the belief that this is due, in a large part, to improved management in recent years. A higher percentage of 5 year cures is to be expected in the future, particularly if conservative resection is reserved for tumors above the peritoneum.

All of the deaths in the entire series were analyzed as to cause, survival time, and debatability in reference to the type of operation performed. Among 62 patients with growths above the peritoneum, conservative resection resulted in only 2 deaths which, because of the level stage and gland involvement of the carcinomas, might conceivably have been prevented by abdominoperineal resection.

Analyses of results in this series indicate that since the results above the bottom of the pouch of Douglas are only 3 per cent less favorable than those which might be obtained by total extirpation of the rectum, the obviation of a permanent colostomy warrants this 3 per cent increase of risk of failure to cure the patient when the carcinoma occurs above the peritoneum. HAROLD LAUFMAN, M.D.

The Surgery of Complications of Ulcerative Colitis. L. KRAEER FERGUSON and LLOYD W. STEVENS. *Gastroenterology*, 1948, 11: 640.

Delay in surgical intervention in ulcerative colitis is frequently justified on the basis of a forbidding mortality, and the belief that ileostomy dooms the individual to a life of restricted activity. These are misconceptions. The surgical mortality of ileostomy is currently less than 5 per cent, and the mortality for colectomy is even less. The handicap of an ileostomy has also been eliminated to a great extent. With the Koenig-Rutzen type of ileostomy bag, the average patient is able to assume fairly normal economic and social activity. Procrastination may cause death from ulcerative colitis.

Perforation, uncontrolled hemorrhage, and obstruction occur after diversion of the fecal stream as well as in the actively functioning colon. Ileostomy offers no insurance against their appearance. It has been said that these patients are too sick to be operated on. In reality, they are too sick not to be operated on. Emergency colectomy is feasible in the treatment of certain cases of perforation and uncontrolled hemorrhage.

Colectomy is indicated also in the presence of long standing irreversible mucosal changes, polyposis, granulomatous masses, and obstructive lesions. In the presence of these lesions, it should not be delayed for long periods of time.

Any colon which has been defunctionalized as a result of ileostomy should be observed periodically. If no indication for colectomy is found, barium enemas and sigmoidoscopic studies should be made from time to time, to discover early evidence of complications. Only in this way can the threat of rapidly metastasizing tumor be removed.

SAMUEL KAHN, M.D.

Rectal Stricture of Lymphogranuloma Venereum. LESTER BREIDENBACH and LOUIS R. SLATTERY. *Ann. Surg.*, 1948, 128: 1079.

Reports of the experiences of many other surgeons are discussed in the present article, and 18 new cases of rectal stricture of lymphogranuloma venereum are presented in outline form. The ages of the patients varied from 20 to 40 years, with colored females predominating. The typical patient is a poorly nourished, exhausted, colored female. The abdomen shows varying degrees of distention; crampy pains and intractable diarrhea are usually

present; secondary anemia is often associated with slight leucocytosis; plasma proteins are low and the albumin-globulin ratio may be reversed; the Frei test is always positive.

The first step in the treatment of patients is to restore them to their normal physiologic condition. To accomplish this, a completely defunctioning colostomy is performed, usually in from 5 to 7 days after admission. The second step is removal of the local focus, which is performed 1 to 6 months later. The operative procedure is described. An inverted "Y" incision is made over the end of the sacrum and around the anus; the lower portion is turned down. The local focus is completely excised, the proximal sigmoid or colon is brought down to the distal segment, and an anastomosis is performed. In the authors' cases, the result of this procedure seemed satisfactory. The third stage of the operation is closure of the colostomy, which is performed, usually, in 4 to 6 weeks following the resection, when the anastomosis and posterior wall are well healed.

All patients who submitted to the completed operation have been restored to normal health. There were no fatalities among the 18 patients subjected to resection. Sphincter control has been attained in all cases. RICHARD J. BENNETT, JR., M.D.

Streptomycin and Surgery in Anorectal Tuberculosis. E. RANSOM KOONTZ. *Surg. Clin. N. America*, 1948, 28: 1643.

A series of 27 cases of anorectal tuberculosis is reported. The patients were treated with streptomycin with and without definitive surgery. Streptomycin therapy supplemental to surgical incision or excision was carried out in 19 cases, and healing occurred in 100 per cent of the cases. In these cases streptomycin was used as an adjunct to recognized proctologic surgical procedures, and meticulous postoperative treatment was not neglected. There were 8 patients who received streptomycin alone. Of this group, healing was obtained in 4 patients while some improvement occurred in the others.

In selected cases in which surgery is contraindicated or deemed inadvisable, streptomycin therapy alone may be utilized with some promise of success but the results will not be as gratifying as when surgery and streptomycin are combined. Streptomycin therapy makes possible in certain cases the performance of a less extensive surgical procedure than formerly would have been justified. It also enables the surgeon to institute surgical treatment of anorectal tuberculosis at an earlier stage in the hospitalization and treatment of the patient with pulmonary tuberculosis and serves as a protection against spread and exacerbation of the pulmonary disease during surgical treatment.

The author believes that streptomycin therapy supplemental to surgery definitely shortens the postoperative period required for healing and prevents recurrence. There was no recurrence in his patients which he treated in this manner.

JOHN L. LINDQUIST, M.D.

Carcinoma of the Anal Canal. J. L. ROUX-BERGER and A. ENNUYER. *Am. J. Roentg.*, 1948, 60: 807.

The authors present an argument in favor of radiotherapy for carcinoma of the anal canal. All lesions in this series were of epithelial origin and therefore considerably more radiosensitive than adenocarcinoma of the rectum. There were 18 five year cures in a series of 51 cases, or a 35 per cent 5 year curability rate.

The authors consider radiation to be the only treatment which gives a chance of avoiding permanent colostomy. However, a comparison of radiotherapeutic and surgical results is impossible for want of a sufficient number of 5 year statistics. The number of failures following radiotherapy is still large, but the authors believe that if the treatment were carried out earlier, when the lesions were still small, the number of cures would be greatly increased. In 11 patients in whom the primary lesion did not extend beyond the limits of the anal canal, 7 were cured.

The authors have abandoned radium implantation in favor of contact roentgen therapy for small lesions and supervoltage roentgen therapy for larger lesions extending outside the anal canal. An evaluation of the correctness of this change cannot be made at this time.

It is the authors' contention that the hope of preserving a normal anus, the results which they have obtained, and the technical improvements which are at present in operation, justify the use of radiation as the primary treatment for carcinoma of the anus. If this method of treatment fails, surgical removal can be carried out, provided the previous radiotherapy has not made operation impossible.

HAROLD LAUFMAN, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

The Nervous Hypergenesis of Cholecystitis (L'hypergénèse nerveuse des cholécystites). L. CORNIL, H. GASTAUT, J. CHARPIN, and H. PAYAN. *Presse méd.*, 1948, No. 57: 669.

These authors call attention to the frequent occurrence of areas of hyperplasia of the nervous tissue in the adventitia of the gall bladder wall found on microscopic section of surgically removed gall bladders. These areas are comparable in histologic structure to the so-called amputation neuromas. They seem in no way related to the neurofibromatosis of Recklinghausen and would appear to be in some way a result of preceding severe inflammatory changes in the gall bladder wall. EDWARD W. GIBBS, M.D.

Postcholecystectomy Symptoms Due to Cystic Duct Remnant. CHARLES BRUCE MORTON, II. *Surgery*, 1948, 24: 779.

Symptoms referable to the biliary tract following cholecystectomy may have a varied etiology. Stones in the ducts, strictures or angulations of the duct, cholangitis, hepatitis, and pancreatitis are some of the etiologic agents.

The author wishes to emphasize that the remnant of the cystic duct left at the time of cholecystectomy may be the cause for persisting or recurring symptoms. He reports 7 personal cases in which operation revealed a cystic duct remnant to be apparently the sole cause of postcholecystectomy symptoms. He therefore concludes that meticulous care should be exercised at the time of cholecystectomy to remove the entire cystic duct. F. J. LESEMANN, JR., M.D.

Late Results of Cholecystectomy: The Factors Involved in Failures and in Recurrences. Personal Experience of the Clinic at Naples (I risultati lontani della colecistectomia: fattori di insuccesso e de recidiva. La esperienza della nostra clinica). LUIGI IMPERATI. *Gior. ital. chir.*, 1948, 4: 547.

This is the second communication concerned with the analysis of the causes of failure in surgery of the gall bladder. The first appeared in the previous issue (August number) of this journal. The material reported in this second communication consists of 118 patients who underwent the original operation and 36 who had previously been operated upon in the author's clinic or elsewhere. The follow-up technique consisted of personal visits of the patient or of answers to a questionnaire. This study could be carried out only in 36 instances because of the exigencies of war; however, the patients reporting presented various types of lesions and the follow-up was conducted at varying periods of time following the clinic treatment, and therefore the findings are regarded as closely illustrative.

In the group of original operations a careful distinction is made between the lithiasic cases and the a-lithiasic gall bladder. In the former the results were regarded as satisfactory in 88.5 per cent of the cases, as mediocre in 8.5 per cent, and as negative in 3 per cent. In the a-lithiasic group the results were regarded as satisfactory in 21.4 per cent, as mediocre in 48.8 per cent and as negative in 29.8 per cent. Of course, the percentage of failures in this material is rather high, but it is ascribed to the greater willingness of those who still suffer, or again suffer, pain and disability to reply to the rather long and involved questionnaire.

As regards the results obtained in the 36 patients who were relaparotomized for continued or recurrent suffering following the original cholecystectomy, such information as is available indicates that the results were satisfactory in 6 cases of repair of a laparocele, in 3 cases of intestinal occlusive symptoms in which excision of the adhesions was done, in 2 cases of ulcus duodenale following excision and gastroenterostomy, and in 2 cases of gynecological conditions (1 case of cystic ovary and 1 of fibroids of the uterus). The results were satisfactory in about 50 per cent of the 3 cases of chronic adhesions and 10 cases of the acute and chronic appendicitis syndrome.

As regards the treatment, the experiences here encountered lead to the conclusion that the treatment of calculous cholecystitis is strictly surgical, and the earlier surgery is instituted, the better. Although the author does not maintain that the treatment for the noncalculous, or a-lithiasic, syndromes is never surgical, yet in the clinic at Naples operation in these cases is becoming ever more rare. He believes that every resource of physical and laboratory examinations, and of all conservative therapy should be exhausted before these patients, as well as patients with postcholecystectomy syndromes, are sent to the operating room.

Special emphasis is placed by the author on the diagnostic advantages to be gained by cholangiography carried out during the laparotomy itself and the therapeutic help to be expected in the nonoperative cases from duodenal drainage.

JOHN W. BRENNAN, M.D.

The Silent Gallstone: a 10 to 20 Year Follow-Up Study of 112 Cases. MANDRED W. COMFORT, HOWARD K. GRAY, and JAMES M. WILSON. *Ann. Surg.*, 1948, 128: 931.

The problem of the silent gallstone has become an increasingly frequent and an increasingly important one. Several pertinent questions are being asked concerning the frequency of occurrence and the advice which should be given the patient who has silent gallstones. Questions also arise concerning whether the patient should be told to undergo cholecystectomy or to await the development of dyspepsia or colic before submitting to surgical treatment, and whether he should be urged to undergo cholecystectomy after the first attack of colic or after several attacks have occurred.

The frequency with which the silent gallstone occurs in the general population is not known.

In the hope of supplying some of the data necessary for decision regarding treatment of the silent gallstone, a long-term follow-up study of all cases in which gallstones were found incidentally during the course of some other abdominal operation at the Mayo Clinic was carried out. The records of 998 such cases occurring from 1925 through 1934 were reviewed and 112 cases were considered suitable for study. The average age of the 112 patients was 48.2 years when the gallstones were discovered.

Although the data compiled do not give conclusive information about the risk of nonoperative and operative treatment of the silent gallstone, they are noteworthy on this basis: the patient with silent gallstone may be told that he has about an even chance that symptoms will develop, that he has about one chance in five that painful seizures will develop and a small chance that jaundice will develop within 10 to 20 years. In addition, he should be told that the risk of surgical intervention at the best is about 0.5 per cent when cholecystectomy is performed before complications develop, that the risk will increase to about 3 per cent if he defers surgical intervention until complications develop, or old age and physical debilities appear, but that the increase in risk is counterbalanced by the fact that if he defers surgical intervention he may never re-

quire operation. It is not possible on the basis of information now available to tell the patient whether the risk is greater or smaller if operation is performed while the gallstones are silent than if it is postponed until symptoms develop. Certainly, the mortality rate will be low regardless of the choice made.

Cholecystectomy may be advised but need not be urged if the patient prefers to accept the chance of experiencing painful seizures or the increased risk of surgical treatment in the event the complication of calculous disease of the biliary tract appears.

Reflux into Wirsung's Canal in Course of Cholangiography. Dystonia of Wirsung's Canal (Le reflux dans le canal de Wirsung au cours des cholangiographies. Dystonies du canal de Wirsung). P. MALLET-GUY, É. GUILLET, and L. DURAND. *Lyon chir.*, 1948, 43: 653.

Cholangiographic studies were done by the authors on 800 patients. Of the 2,826 films, 1,329 were taken preoperatively and 947 after the operation. In 173 cases, or 21.6 per cent of the entire material, a reflux of the opaque material into the main pancreatic duct was noticed. In 65 cases the opaque medium was introduced into the gall bladder, in 100 cases directly into the common duct, and in 8 cases into both.

An analysis of the technical factors and the clinical observations showed that no reflux occurred in patients with intact biliary and pancreatic systems. A reflux of the opaque medium into Wirsung's duct was recorded in 12 patients with mechanical obstruction of Vater's papilla, in 53 with a hypertonic sphincter of Oddi, in 36 with a hypotonic sphincter of Oddi, in 40 with chronic pancreatitis without disturbance of sphincter function, in 2 with acute pancreatitis, and in 30 with various pathologic conditions of the biliary system, among them 19 with attacks of jaundice.

The authors mention several sources of diagnostic errors. A reflux may be simulated by images of osseous structures or of the duodenum, or by duplication of the shadow of the common duct caused by respiratory movements. Conversely, difficulties in visualizing a reflux may be caused by a filiform duct of Wirsung or by the location of this duct behind the common duct.

The type of dystonia of Oddi's sphincter can be determined by manometric measurements.

The phenomenon of the reflux disappears after elimination of the dystonia; namely, splanchnicectomy for hypotonus; and infiltration of the vagus nerve, sphincterotomy, or medical treatment (administration of beta-phenylisopropylamine sulphate or inhalation of amyl nitrite) for hypertonus.

The authors introduce a concept of dystonia of the main pancreatic duct which in turn may produce pancreatic lesions. They advance the hypothesis of a painful functional syndrome of the pancreas, comparable with a similar condition of the biliary tract. Such a syndrome may be responsible for the symptomatology of the dystonia of the sphincter of Oddi. The existence of a reflux into Wirsung's duct in the presence of acute or chronic pancreatitis without demonstrable lesions or functional disturbances of the sphincter of Oddi constitutes a physiopathologic problem that awaits elucidation.

JOSEPH K. NARAT, M.D.

Traumatic Rupture of the Choledochus Associated with an Acute Hemorrhagic Pancreatitis and a Bile Peritonitis. N. FREDERICK HICKEN and VERNON L. STEVENSON. *Ann. Surg.*, 1948, 128: 1178.

The authors present the case history of a 7 year old white boy who was injured by compression of the upper abdomen. The boy was treated immediately and dismissed. Four days later he was readmitted to the hospital because of nausea, vomiting, dehydration, and increased jaundice. His temperature was 104.8 degrees F. Emergency treatment was given, and after 4 days of intensive preoperative preparation, the abdomen was opened. At this time 2,300 c.c. of normal appearing bile were aspirated from the abdominal cavity, and 2,100 c.c. of bile were aspirated from the lesser omental cavity. In order to localize the tear in the common bile duct, 50 c.c. of a 70 per cent diodrast were injected into the collapsed gall bladder, and a cholangiogram was taken. The bile system was visualized, and it was considered that the edematous pancreas had occluded the opening into the duodenum, since none of the medium passed through the ampulla of Vater. A tear was visualized on the posteromedial wall of the common bile duct. A traumatic pancreatitis was the complicating factor. A cholecystostomy was used to decompress the common duct while the obstructive pancreatitis was subsiding.

Supportive therapy was administered. Subsequent cholangiograms showed that the tear in the common duct had healed and, finally, that once again the bile was flowing normally into the duodenum. The drain was then removed. A period of 10 months has elapsed since the injury, and the results have been satisfactory. A total of 8,900 c.c. of bile was aspirated from the abdominal cavity.

RICHARD J. BENNETT, JR., M.D.

Choledochus Cyst Associated with Congenital Atresia of the Bile Ducts. CHARLES B. RIPSTEIN and G. GAVIN MILLER. *Ann. Surg.*, 1948, 128: 1173.

The case of a female infant, age 4 months, is presented. The child had been jaundiced from the time of birth. At operation, a cyst of the common duct was found. This was associated with a congenital atresia of the bile ducts. The condition in this patient may have been due to abnormality in the development of the bile ducts.

RICHARD J. BENNETT, JR., M.D.

Postoperative Biliary Dyskinesia Due to Neuroma of the Cystic Duct (Disquinesia biliar post-operatoria por neuroma del cistico). JUAN LEVY BOLADERES. *Bol. sec. san. pol. nac.*, 1948, 4: 470.

For several years a woman of 26 years had suffered from painful crises in the right hypochondrium and flank accompanied by frequent vomiting and a bitter

taste. She had been subjected to appendectomy and salpingectomy on the right side, but her symptoms persisted and she was finally seen by the author, who made the diagnosis of biliary dyskinesia due to atony of the gall bladder and recommended cholecystectomy.

At operation the gall bladder was removed and a separate ligation of the artery and cystic duct was performed; this was followed by choledochotomy and the introduction of a T-tube. The choledochus was of normal size and was surrounded by an abundant nerve plexus. Recovery was uneventful. The woman remained well for 14 months and then began to have slow digestion accompanied by nausea and occasional vomiting and 6 months later her symptoms were as bad as before the operation. The biliary dyssynergia was evidently of neurogenic origin. At operation the choledochus was exposed and a small tumor, about 1 cm. in diameter, was found to be adhering to it at the site of implantation of the cystic duct; it was freed with a scissors and removed. Recovery was prompt and the patient has remained well. The specimen presented a small cavity corresponding to the obliterated canal, and its wall was thickened by proliferation of fibrosclerous tissue; section of the wall revealed massive enlargement or the neuromatous nerve endings.

For a number of years the author has performed direct cholecystectomy from the fundus to the cystic duct after placing a temporary hemostatic ligature on the pedicle. Now he incises the peritoneal fold which covers the cystic duct at its junction with the choledochus, dissects as far as possible the nerve filaments that pass from the choledochus to the cystic duct and resects them; he also dissects, if possible, the cystic artery, ligates and cuts it, and then proceeds as usual. If the inflammatory edema or the obesity of the patient does not allow correct performance of this step, he frees the gall bladder from the fundus to the cystic duct after placing the temporary hemostatic ligature, and then cleans the cystic duct of all tissue that surrounds it, and ligates the duct. When the temporary ligature is removed, it is easy to catch the cystic artery and to ligate it if it has not been previously tied off while the gall bladder was freed.

RICHARD KEMEL, M.D.

Recurrent Acute Pancreatitis: Observations on the Etiology and Surgical Treatment. HENRY DOUBILET and JOHN H. MULHOLLAND. *Ann. Surg.*, 1948, 128: 609.

The case histories of 21 patients exhibiting attacks of acute recurrent pancreatitis are recorded and analyzed with respect to the value of the surgical division of the sphincter of Oddi. The rationale of such treatment is twofold: it is dependent (1) upon an anatomic variation in the entrance of the main pancreatic duct into the duodenum which creates a common biliary-pancreatic passageway that permits bile to flow into the pancreas, and (2) upon the contention of Archibald that spasm of the sphincter of Oddi produces a bile diverting mechanism.

Studies on human patients with proved acute recurrent pancreatitis substantiate the contention that when a common passageway exists, spasm of the sphincter will produce the disease and sectioning of the sphincter will relieve it. It is well known that morphine, by producing spasm of the duodenal wall, increases the resistance of the sphincter to the flow of bile. Also the application of N/10 hydrochloric acid to the papilla of Vater will produce spasm of the sphincter of Oddi. After section of the sphincter muscle, the hydrochloric acid effect on the papilla is abolished. The sphincter can no longer become spastic and biliary reflux under pressure is prevented. However, the morphine effect on the duodenal wall persists. Thus, reflux of the duodenal contents into the biliary tract is prevented even though the sphincter has been sectioned.

The actual sectioning of the sphincter is a somewhat exacting procedure. The papilla is difficult to find and when the muscle is in spasm the orifice may be extremely small. The best approach is through the common bile duct. The duodenum may be opened over an instrument or over a probe. The muscle is then cut over the probe for about 1 cm. in the anterior free or intraluminary portion of the duct. The retraction of the sphincter muscle fibers prevents healing or regeneration of the muscle.

ORVILLE F. GRIMES, M.D.

The Operative Diagnosis of Duodenal Pancreatic Indurations (Diagnostico operatorio de las induraciones del duodeno-pancreas). LORENZO H. MARTIARENA. *Bol. Inst. clin. quir.*, B. Air., 1948, 24: 91.

It is believed that because of the advancement in diagnosis and treatment of lesions of the head of the pancreas, a new anatomic entity, the duodenopancreas, should be taken into account. This is true particularly as this section has its own neurovascular individuality and its own pathologic anatomy.

Because obstructions from tumors are similar in their effect to obstructions from inflammatory processes, understanding of the duodenopancreas segment will prevent needless surgery, such as pancreatectomy, for a simple inflammatory condition. Diagnosis of this type of obstruction is facilitated by the routine palpation of the head of the pancreas. The surgeon will become familiar with the normal consistency of the structure, and as a result a silent lesion will not be overlooked.

When necessary, surgical exploration should be resorted to unhesitatingly. Exploration of the duodenopancreatic area for obstruction is easily accomplished by sectioning of the duodenal pancreatic ligament, diagnostic puncture of the obstruction, biopsy of the pancreas, biopsy of the ganglioperipancreatic area, biopsy of the hepatic metastasis, or exploratory duodenectomy.

Pancreatic obstruction may be classified into definite pancreatic or duodenopancreatic obstruction, or obstruction in the region of the ampulla of Vater.

It is stated that in patients with symptoms of biliary lithiasis without jaundice and in those pre-

senting cholelithiasis with a nodular obstruction in the head of the pancreas, the diagnosis of chronic pancreatitis secondary to lithiasis is justified.

On the other hand, in patients with the same symptoms plus jaundice who present stones in the gall bladder or in the choledochal ducts with obstruction in the head of the pancreas, and who on choledochectomy reveal that the pancreatic obstruction is not of calculous origin and the obstruction is not from the choledochus, the condition is without a doubt secondary pancreatitis.

However, in patients with painless jaundice, a tumor in the biliary or pancreatic ducts, despite normal appearance of these ducts (whether they be dilated or not), and an obstruction in the duodenopancreas area, the diagnosis of cancer is correct.

STEPHEN A. ZIEMAN, M.D.

Pancreatolithiasis (La litiasi pancreatica). MARCELLO INNOCENTI. *Ann. ital. chir.*, 1948, 25: 413.

Among 20,000 surgical patients operated upon in Florence, stones in the pancreas were found only in 1, a man of 45 years. In addition to this case the author reports another in which the diagnosis was established clinically and roentgenologically. The patient, a 52 year old woman, was not operated on.

The first patient was admitted with complaints of pain in the epigastrium and in the left upper quadrant of the abdomen of a few years' duration. The x-ray findings suggested the presence of a duodenal ulcer; in addition to it, a shadow with irregular outlines was visualized to the right and to the left of the vertebral column at the height of the stomach. The operation failed to demonstrate any lesion of the stomach or duodenum but a circumscribed induration was palpated in the body of the pancreas. A stone 1.75 cm. in diameter was extracted. A postoperative roentgenogram disclosed a few more shadows in the region of the pancreas. The patient developed cachexia and expired 4 months after the operation. The stone contained carbonates and calcium but no oxalates or phosphorus, and gave a positive xanthoprotein reaction. Although stones in the pancreas may accompany arteriosclerosis, neoplasms, or syphilis, inflammatory processes propagated by contiguity or reaching the pancreas through the blood or lymph stream play the most important role in the production of stones.

The author collected from the literature 74 cases of stones in the pancreas. In the majority of cases the stones are multiple and consist of calcium phosphate (80%), calcium carbonate (17%), and organic matter (3%). A latent and a painful form, with or without intermittent jaundice, may be differentiated. A transient or persistent glycosuria is found in many instances. The examination of feces usually reveals a disturbance of the function of the pancreas. If a generalized lithiasis or so-called petrification of the pancreas is found in roentgenograms, a conservative treatment is the method of choice. Otherwise the stones should be removed surgically.

JOSEPH K. NARAT, M.D.

Splenomegaly, Splenic Arteriovenous Anastomosis, and Banti's Disease (Splenomegalia, anastomosi arterovenose spleniche e malattia di Banti.) PIETRO FRANCESCHINI. *Sperimentale*, 1948, 99: 1.

In 1939 the author first described the existence of arteriovenous anastomosis in a spleen removed from a patient with Banti's disease. He thus established that the sinus apparatus is not the only communication between the arterial and venous system. The arteriovenous anastomosis allows for direct and rapid emptying of the arterial blood into the larger veins. This is the method which causes reduction of the size of the spleen when adrenalin is administered to the patient.

The author thus concludes that Banti's disease is caused by an irreversible disturbance in the functional cycle of the splenic sinuses, which results in a progressive enlargement of the spleen. This disorder is not relieved by ligation of the splenic artery and, hence, splenectomy remains the procedure of choice in the treatment of Banti's disease.

LUCIAN J. FRONDUTI, M.D.

On Splenectomy, with Special Reference to Indications. H. ABRAHAMSEN and N. B. KRARUP. *Acta med. scand.*, 1948, 131: Supp. 213, p. 9.

This study of 45 splenectomized patients shows that the diagnoses considered to be indications for splenectomy are not always well defined pathologically but often cover more or less vague collective notions. In each case the primary diagnosis, the findings at operation, and the postoperative course of the disease have been studied in an attempt to clarify the diagnostic problems and indications for splenectomy. Uncertainty is especially conspicuous in the case of the diagnosis of Banti's disease.

There were 16 splenectomies based on the supposition that the patients presented Banti's disease. When a later examination took place only 4 of the group were alive; of these, 3 had been materially benefited, while the condition of 1 was unchanged. There were 4 deaths immediately after the operation, and 7 patients died from 3 months to 2.5 years after operation. A revision of the diagnoses on the basis of the postmortem findings and later examination leads to the conclusion that it would be most expedient not to use the diagnosis of Banti's disease in clinical work at all. In cases of splenomegaly with or without anemia the primary diagnostic task must be an attempt to reveal any specific disorder underlying the splenomegaly (leucosis, nonleucemic myeloid splenomegaly, lymphogranulomatosis, reticuloendotheliosis, Gaucher's disease, tumor, tuberculosis, or syphilis). If found, splenectomy will almost always be contraindicated. It will also be almost always contraindicated in the presence of liver cirrhosis. Splenectomy will be indicated for cryptogenetic splenomegaly without liver involvement and for thrombosis of the splenic vein.

There were 12 patients splenectomized for hemolytic jaundice, in half of whom a hereditary factor was established. Splenectomy appeared to be the

treatment of choice in subacute and chronic cases, and was the treatment of necessity in acute, critical cases.

A review of 6 cases of splenectomy for chronic essential thrombopenia showed that the effect of splenectomy was immediately good in all cases and of lasting benefit in all but 1 case.

There were 4 patients operated on because of splenomegaly, the splenic enlargement affording the indication for operation, and 7 patients operated on because of ruptured spleen.

JOHN L. LINDQUIST, M.D.

Splenectomy in Brucella Infection (La splenectomia nella infezione brucellare). GIUSEPPE GIUNCHI. *Policlinico, sez. med.*, 1948, 55: 125.

In 1 case of brucellosis resistant to vaccinotherapy, penicillin and sulfonamides were administered, but a cure was obtained by splenectomy. The weight of the removed spleen was 960 gm. The organ contained multiple hemorrhagic infarcts. Hepatomegaly and bilirubinemia subsided after the operation. Periodic clinical, bacteriologic, and serologic examinations during the first postoperative year failed to disclose any evidence of brucella infection.

In the second case complications in the form of a grave anemia, left orchitis, and painful limitation of motions of the left hip were present. The failure of conservative treatment suggested a more radical procedure. In view of the grave condition of the patient, instead of splenectomy a ligation of the splenic artery was performed. A large amount of hemorrhagic fluid was encountered in the peritoneal cavity. Within the first 10 postoperative days 18 more liters of similar fluid were withdrawn by paracentesis, repeated 3 times. Three years after the operation the patient was in perfect health.

In selected cases such operative procedures may supplement or replace the treatment of brucellosis with streptomycin alone or in combination with sulfonamides. JOSEPH K. NARAT, M.D.

MISCELLANEOUS

The Traumatic Condition of the Abdomen. ARTHUR R. METZ, RAYMOND HOUSEHOLDER, and GERRIT DANGREMOND. *Am. J. Surg.*, 1948, 76: 368.

Injuries to the intra-abdominal organs are not uncommon and usually are serious. Their successful management depends on early, accurate diagnosis followed by immediate intelligent treatment. An understanding of the anatomy of the abdominal area and the mechanism of injury, and a thorough routine of examination are essential in caring for the patient who has sustained trauma to the abdomen.

Distended organs are more liable to injury than empty ones; consequently, abdominal injuries are more likely to produce damage to the hollow viscera when sustained soon after the ingestion of food.

The most common causes of abdominal trauma are as follows: (1) direct violence, such as a blow to the abdomen by some blunt object, as a piece of wood or a tool that the individual may be handling, (2) indirect violence as a fall from a height of a few feet or more, the impact of landing producing the injury; (3) nonpenetrating wounds, for example, squeezing injuries from pressure between moving objects; and (4) penetrating wounds such as from a stab or gunshot.

Success in managing cases of traumatic injuries to the abdomen may well depend on the primary examination of the patient and the recorded findings by the first attending physician. A thorough examination routine is helpful and should be combined with the taking of an accurate history concerning the injury.

An accurate history and description of the mechanism of the accident should be obtained to determine the amount of violence, distance of the fall, or any other facts that may be of value in determining the possible severity of the injury. The patient's reaction immediately following the accident should be ascertained—whether he noticed a sudden, sharp pain, whether he had to sit down or stop work for a short period of time, or whether loss of consciousness occurred immediately. Did the patient vomit and, if so, was blood present in the vomitus? Does the patient remember the details of the accident? This information may have an important bearing in helping to determine the extent of injury and in arriving at a diagnosis. In addition, it may be valuable for future reference as stories of accidents frequently change after time has elapsed.

When the patient is first seen, particular attention should be given to, and a record made of, the degree of shock, the volume and rate of the pulse, the blood pressure, temperature, and respiration. A blood count and urinalysis should be made. This gives the physician a basis for the status of the blood so that changes may be noted on frequent repeated counts. The presence or absence of blood in the urine is to be noted. It may be necessary to catheterize the patient to obtain a specimen.

The physical examination must be comprehensive.

Roentgen films showing the entire abdomen, including the pelvis and lower chest, should be made.

The management and treatment of traumatic injuries of the several organs of the abdomen are presented in considerable detail.

Patients operated upon within the first 6 hours after a severe injury have better chances of recovery than those in whom surgery is delayed beyond the 6 hour period. In case of doubt it is safer to explore the abdomen than to delay surgical treatment too long as it may jeopardize the life of the patient.

JOHN E. KIRKPATRICK, M.D.

Two Cases of Enterogenous Cysts. SVEN RÖKAEUS. *Acta obst. gyn. scand.*, 1948, 28: 113.

The author reports 2 cases of enterogenous cysts, one from the Kronprinsessan Lovisa's Hospital for Children in Stockholm. One of the patients, a 25 year old woman, had a rectal cyst with symptoms not definitely related to the cyst. The other patient was a 6 weeks old boy without symptoms. Both of the

cysts were removed and the diagnoses were confirmed by microscopic sections.

Four other cases of rectal cysts were reported from the literature, and the discussion centered about the origin of the cysts.

The author's concept differs from those of Ladd and Gross, and Bremer, as he believes that the rectal enterogenous cysts are remnants of the tail gut analogous to certain cysts which are remnants of the vitelline duct. Bremer believes many cysts and particularly reduplications arise from defective resorption of the epithelial occlusion of the intestine. Bremer and the author agree with Ladd and Gross that mesenterically situated enterogenous cysts originate from the buds of intestinal epithelial cells found in the fetal alimentary tract on the outer side of the epithelial layers of the digestive tube. These buds were originally described by Lewis and Thyng.

JOHN H. KAY, M.D.

Gastroenterology and Surgery. SARA M. JORDAN. *J. Am. M. Ass.*, 1948, 138: 791.

In this article, the author stresses the correlation of gastroenterology and surgery for the good and well-being of the patient. The successful diagnosis and treatment of diseases of the digestive tract depend on the knowledge and experience of both the gastroenterologist and the surgeon. Neither has a monopoly in the field, and the best results are obtained only if both work with tolerance and co-operation. The perfect relationship is, therefore, one in which there can be reasonable discussion of the surgical and medical procedures, without the barriers of prejudice, suspicion, or patronizing attitude of one or the other.

The differentiation of structural and functional disease is not without its pitfalls in all parts of the body, but the digestive tract, easily accessible as it is to abuse and irritation, harbors peculiar perplexities for the diagnostician. In the past, many normal gall bladders and appendixes have been removed, and the surgeons, perhaps temporarily comforted by pathologic reports of chronic cholecystitis and appendicitis, have had unhappy patients return after a few months with recurrence of the preoperative symptoms.

The author points out that functional disorders which are present in conjunction with organic disease, and organic disease lurking under cover of obvious functional disorders are too often found in a complete diagnostic survey to allow of exclusively concentrated attention on any one group of symptoms. The diagnostic problems met with in peptic ulcer, gall-bladder disease, and inflammatory and ulcerative diseases of the small and large intestine are best solved by joint consultation between the surgeon and gastroenterologist.

The diagnosis and treatment of cancer of the digestive tract remains unsatisfactory because too often it is discovered too late. The vital importance of the differences between benign and malignant ulcers is best understood when there is a harmonious and reciprocal relationship between the surgeon and the gastroenterologist. EDWARD F. LEWISON, M.D.

GYNECOLOGY

UTERUS

The Problem of the Presence of Sensitive Corpuscles of the Uterus (Sulla questione della presenza dei corpuscoli sensitivi dell'utero). NICOLA DAMIANI. *Quad. clin. ostet. gin.*, 1948, 3: 356.

Keiffer described the presence of sensitive corpuscles in the myometrium and mocosa of the uterus. He enumerated 19 types in the myometrium and 2 or 3 in the mucosa. He also described a neuromuscular type of corpuscles as the most common one found near the cervix and in the proximity of the blood vessels.

The author failed to find any such structures in his histological studies and states that such sensitive corpuscles are the walls of arteries which have been cut obliquely, and that, physiologically, uterine sensation is so poor that it contradicts the existence of so many sensitive corpuscles.

JOSEPH M. A. PAPE, M.D.

Radiologic Diagnosis of Uterine Cancer (Diagnóstico radiólogico del cáncer uterino). GONZALO ELIZONDO MARTEL. *Arch. cubanos cancerol.*, 1948, 7: 127.

In 1,665 intrauterine hysterograms for cancer there were no accidents. The uterus was filled gradually by the spot roentgen technique and the luteinic phase was chosen as the best time of the menstrual cycle for good diagnostic results.

The diagnosis is based upon uterine tonicity and contractility. In the premenopausal phase while follicular function is active a tumor is revealed by an increase in contractility similar to that seen when a foreign body is in the uterus. In large infiltrating tumors, contractility is not observed, but a globose relaxation of the entire organ may be seen. In the postmenopausal stage the uterus appears dormant under the filling and distends without resistance.

The presence of filling defects may be detected by direct semiologic studies. At first the deformity appears small, fixed, and irregular in outline. This disappears as the uterus balloons out. In carcinoma there is no erasure of these features.

Hysterograms are considered of absolute value in the localization of a lesion but only of relative help in diagnosis. They are particularly useful in obtaining information concerning uterine depth, location for the biopsy, and differentiation between intrauterine and extrauterine tumors.

STEPHEN A. ZIEMAN, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

The Significance of Cystic Enlargement of the Ovary with Respect to Treatment. IRVING L. FRANK. *Med. Clin. N. America*, 1948, 32: 1611.

The author discusses cystic enlargement of the ovary and states that these cystic collections arise either by the obstructive accumulation of the secretions of normal cells, or from the secretions of liquefaction necrosis of neoplastic cells. Most cystic enlargements of the ovary are due to perversions of the follicle apparatus and are physiologic variants. They are usually 5 cm. or less in diameter and are classified as "non-neoplastic" or "physiologic" cysts of the ovary.

On gross examination it is seen that the ovarian enlargement is due to the presence of many cysts varying from buckshot to cherrystones in size, scattered through the parenchyma, and usually occurring bilaterally.

Microscopically, congestion, edema, and fibrosis of the stroma, and "cirrhosis" of the ovarian tunic is found.

The author states that the most common causes of cystic enlargement are: (1) inflammation—usually acute bacterial inflammation; (2) mechanical factors, such as ovarian prolapse with passive congestion and edema; and (3) hormonal imbalance.

The differential diagnosis between non-neoplastic cysts and true cystomas is difficult, but in general non-neoplastic cysts are usually bilateral, many decrease in size with time, do not usually exceed 5 cm. in diameter, and produce minor menstrual disorders, while neoplastic cysts are usually unilateral, enlarge constantly, and do not affect the menstrual cycle.

Two rather constant symptoms are produced by the non-neoplastic cysts: bilateral deep and boring lower abdominal pain with radiation to the thighs and back, and menstrual disorders.

Treatment is varied, but, in general, observation with repeated pelvic examinations is all that is required; correction of uterine displacements and improvement of the pelvic circulation with pessaries and postural exercises, and the control of pelvic infection may be of value in many cases. Hormone therapy utilizing large doses of stilbestrol, as advocated by Karnaky, or testosterone may be considered.

In general, surgery is not indicated in the treatment of the non-neoplastic cysts and should be considered only when the ovarian dysfunction is profound and the structural ovarian changes are definite.

J. ROBERT WILLSON, M.D.

A Report of 2 Cases of Tumor of the Internal Theca of the Ovary (Relation de deux cas de tumeurs de la thèque interne de l'ovaire). L. GRÉGOIRE. *Bruxelles méd.*, 1948, 28: 2227.

Two patients had been subjected to total hysterectomy. The first, aged 57, had a uterine fibromyoma and a thecoma of the right ovary; the second, aged 61, had a uterus too large for her age, a fibroma of the left ovary, and a calcifying and degenerating (hyaline) thecoma of the right ovary. Both had more frequent bouts of hot flushes after the opera-

tion than before it, and the breasts of the first patient were decidedly enlarged for some time.

The 2 cases represent the 2 principal forms of thecoma, the cystic variety described by some authors being probably a sort of follicular or luteinic cyst. When the epithelioid zones are very important (first case), recalling the thecal tissue of the corpus luteum, the differential diagnosis from the insular and sarcomatoid form of tumor of the granulosa may offer some difficulty. The argyrophile reticulum exists only in tumors of the theca; in addition, the tumors of the granulosa present, here and there, zones of epithelial follicles with Call-Exner corpuscles. The fibrous form (second case) differs from ordinary fibroma by the presence of masses of epithelioid cells, by lipoid overload of the cells, especially cholesterol, and by its hormonal action.

According to Greenhill's 1947 Year Book of Obstetrics and Gynecology, about 100 cases have been reported up till now. About 70 per cent occur after the menopause, mostly between the ages of 50 and 60. There has been no case before puberty and no coexistence with pregnancy. The youngest patient was 12 years of age, the oldest 92. The symptoms of hyperfolliculinemia are manifested by reactions of the receptor organs, especially the uterus, with more or less functional disturbances. Of 50 uteri of which the mucosa was studied, 38 were hyperplastic (32 after the menopause), 3 normal, 2 atrophic, 5 malignantly adenomatous, and 2 pregravidic (these should be classed as luteomas). Of 52 described uteri, 24 had a fibromyoma, 17 revealed diffuse hypertrophy of the myometrium and 5 adenomyosis, while 7 were normal and 4 subnormal. Mammary congestion has been noted in some cases, among them being 1 patient at the age of 92. Functional disturbances varied and were sometimes absent: hemorrhagic metropathy during sexual life, and cyclic or irregular bleeding after the menopause (73 per cent of the cases). There may be glandulocystic hyperplasia without hemorrhages as in the second case. Removal of the tumor has caused menopausal disturbances in patients who were far beyond the menopausal age. Only 3 of 82 cases have presented a malignant evolution. The metastases also have a hormonal action. Bilaterality of a solid tumor of the ovary suggests a malignant nature.

Treatment is essentially surgical and conservative in young women. In case of solid tumor, the other ovary should always be explored. The radiosensitivity of thecomas seems to be low.

RICHARD KEMEL, M.D.

Disgerminoma of the Ovary (El disgerminoma ovárico). J. M. BEDOYA. *Rev. espan. obst.*, 1948, 5: 209.

The cellular elements of disgerminoma of the ovary are found in the testes and ovaries. This tumor has many synonyms. It is usually assumed that the structure of the organ has been invaded. It is a solid homogeneous tumor, frequently bilateral in occurrence. As it is histologically malignant, it grows rapidly, as a rule, and once it breaks through its capsule it invades all of the adjacent pelvic structures.

Fortunately, this tumor is rare. It occurs most often in young persons, and histologic examination is necessary to determine its nature.

Treatment is surgical followed by roentgentherapy

STEPHEN A. ZIEMAN, M.D.

Primary Carcinoma of the Fallopian Tube. A Clinical and Pathologic Study with Personal Contributions (Il carcinoma primitivo della salpinge uterina. Contributo personale e studio clinico ed anatomopatologico). G. VALLE. *Ginecologia*, Tor., 1948, 14: 383.

After reviewing about 500 articles, the author writes a comprehensive monograph embracing all the aspects of primary carcinoma of the fallopian tube. His opinions are based on 2 personal cases and a detailed study of 51 acceptable cases derived from the literature.

It was found that this tumor occurs once in 10,000 gynecological patients, which is rare enough so that many gynecologists never see one. It is often confused with secondary carcinoma of the tube, which occurs 10 times more frequently than the primary type. Pain, vaginal discharge, and pelvic tumor are the most constant symptoms, but none of these is pathognomonic. The pain is usually colicky, sometimes violent, localized in the lower abdomen, and occasionally radiating to one of the thighs. The discharge may be of any type and is in no way diagnostic, except that microscopic examination may reveal malignant cells, which, however, would not localize the lesion in the tube. The mass is rarely noticed by the patient, but is felt by the surgeon during pelvic examination. It may be tender and usually is unilateral. Frequently it is disguised by a coexisting inflammatory process. At operation the carcinoma is usually overlooked because of associated fibroid or inflammatory masses. Pathologic examination generally reveals the tumor not to be of a high grade malignancy, but there is an exceptionally early infiltration of contiguous structures, possibly caused by expulsion of the cells from the narrow tube. The prognosis is grave; only an occasional patient survives 5 years.

The treatment of choice is panhysterectomy, preferably with dissection of the pelvic glands. Unfortunately this is rarely done because the diagnosis is not made until the routine microscopic sections are examined. It is recommended that surgeons make a more careful examination of the diseased tissues at the operating table, and order frozen sections when in doubt.

One of the author's records consisted only of the pathologic report, as the clinical record and patient had been lost during the war. The second case was that of a 38 year old nulliparous female who gave a past history of untreated active syphilis, one miscarriage of a macerated fetus 10 years previously, and uterine suspension for metrorrhagia about 18 months previously. The essential symptoms and

physical findings consisted of intermittent, colicky, abdominal pain in the left lower quadrant radiating to the thigh; yellow, watery vaginal discharge not related to the episodes of pain; and bilateral tender tumefactions of the adnexa, interpreted by the examiner to be pelvic inflammatory disease. At operation there were found bilateral hydrosalpinx and numerous inflammatory pelvic adhesions. The specimen seemingly corroborated the clinical impression and led the operator to remove only the tubes. The pathologic report revealed a primary carcinoma of the left fallopian tube. Histologically the tumor was primarily glandular with papillary and alveolar aspects and was considered to be of high grade malignancy. At the time of writing, 2 years after the laparotomy, the patient was gravely ill from abdominal metastases, notwithstanding massive doses of deep roentgen therapy.

N. CHRISTIAN MEYER, M.D.

EXTERNAL GENITALIA

Two Cases of Vaginal Atresia Observed in Duplex Anomalies of the Genitalia. KEIJO SOIVA. *Ann. chir. gyn. fenn.*, 1948, 37: 276.

The author observes that imperforation of one side of a double vagina is comparatively rare. Divergent opinions have been expressed as to the frequency of duplication of the genitalia. The literature on this subject is reviewed briefly by the author. One writer has found only 3 cases among 19,000 patients, whereas another found 10 such malformations among 7,400 patients.

There has been much controversy as to the causes of atresia in genital passages. In the earlier literature, they were unanimously considered to be of a congenital nature. In the opinion of more recent investigators, all imperforations found in otherwise normally developed genitalia are secondary phenomena, that is, cicatrices that appeared after birth due to inflammatory processes. This is also considered the cause of imperforation, at least in the majority of double anomalies of the genitalia. It is observed by the author that other more recent writers reviewed do not entirely exclude acquired atresia, although they believe that the majority of imperforations in double genital passages are congenital. The formation of cicatrices causing imperforation may develop after serious inflammations of the vagina, which in children can be due to gonorrhea, but which have sometimes been observed also in connection with scarlet fever, diphtheria, or pneumonia, or as a consequence of puerperal fever or febrile abortion.

After a brief presentation of the symptoms of vaginal atresia, the author discusses the diagnosis. Operative treatment alone is of help in these cases of vaginal atresia. The extent of the intervention must be carefully considered for each individual case. If there is an accumulation of blood or collection of pus confined to the vagina, only the removal of the septum dividing the vagina is done. If, on the other hand, the accumulation of blood and pus extends or is believed to extend into the uterine cavity or into the fallopian tubes, a removal of the uterus and of the tube is generally advocated. Sometimes total extirpation of the uterus is necessary.

The author presents in detail 2 cases in which atresia was found in one of the double vaginas. In one of the cases, that of a girl of 15, the operation revealed a double uterus and an accumulation of blood in the left vagina, uterus, and fallopian tubes which had developed together with congenital atresia of the left vagina. The left uterus with its adnexa was removed and the hematocolpos directed into the right vagina. In the second case, a girl 9 years of age was found to have 2 narrow vaginas divided by a thin septum, in the upper part of which there was an imperforation with a collection of pus. The septum was removed. No portio uteri was found at the end of the vagina, nor was the uterus palpable in the internal examination.

HERBERT F. THURSTON, M.D.

MISCELLANEOUS

Newer Concepts of Menstruation. IRWIN H. KAISER. *Am. J. Obst.*, 1948, 56: 1037.

Bleeding is the most conspicuous feature of the menstrual process. Because of this, a large part of the laboratory and clinical study of menstruation has been directed toward the blood vessels of the endometrium. An explanation of the cyclic uterine bleeding as a consequence of alterations in the coiled arteries of the endometrium has gained widespread acceptance.

There are two basic interpretations of menstruation. A mechanical concept is based on the observation that the coiled arterioles increase rapidly in complexity and extent as the secretory phase of the cycle progresses. This increasing complexity reaches a point at which it impedes the flow of blood to the endometrium and produces ischemia, which then sets off the chain reaction of menstruation. A pharmacodynamic concept stems from the observation that prolonged periods of vasoconstriction are invariable precursors of other menstrual changes. The growth and differentiation of the coiled arterioles render them sensitive to the action of vasoconstrictor substances. These then produce vasoconstriction, ischemia, and menstruation. Both concepts assume that continued growth of a complex, coiled arteriole is a necessary precursor of menstruation. Such hypotheses often bypass or contradict the earlier work on hormone withdrawal as the common precursor of menstrual flow.

The erroneous conclusions based on this faulty vascular hypothesis of menstruation are demonstrated by the recent observations of arteriovenous anastomoses in human endometrium, the presence of relatively vast areas of coiled arteries during early pregnancy with the absence of bleeding, the occurrence of bleeding during an anovulatory cycle when the arteriolar bed is much simpler than that of true

menstruation, and the presence of menstruation in New World monkeys in the absence of coiled arteries.

The current explanation of menstruation, based upon alterations of the coiled arterioles, fails to account for much that is known about the menstrual process. It appears that the coiled arteriole is of principal importance primarily in the process of implantation of the embryo. JOHN R. WOLFF, M.D.

Preliminary Results of Streptomycin Therapy in Tuberculosis of the Peritoneal Cavity and of the Adnexa in the Female (Primi resultati della terapia streptomicinica nella tubercolosi peritoneale —annessiale). EUCLIDE FORLINI. *Quad. clin. ostet. gin.*, 1948, 3: 424.

Four cases of tuberculosis of the female genitalia, 2 of which were verified by laparotomy, were treated by the local and parenteral administration of streptomycin, accompanied by general medical therapy (rest and ultraviolet irradiation therapy, and the administration of vitamins A and D, and calcium thiosulfate). In 2 instances the drug was administered into the residual ascitic fluid after part had been withdrawn, in the others the administration was entirely parenteral or by injection into the masses of adnexal tissues through the vaginal fornix. The dosages were never more than from 250 to 500 mgm. per day.

In every case, after treatment of a few days to a few weeks the ascites disappeared, the abdomen became flaccid and painless, and the adnexal masses entirely disappeared. These patients were followed up for as long as 5 months after treatment; the fever had ceased and in every instance there seemed to be complete cure.

The author admits that his cases are few, that the tubercle bacillus was not demonstrated in any of the material withdrawn, and that the general therapeutic measures, including pretherapeutic laparotomy in 1 case, may have helped in the cure, and, finally, that complete cure was not proved in any of these patients; nevertheless, he believes that the results procured are sufficiently encouraging to indicate that the authorities should put streptomycin at the disposal of the gynecologist, as well as of the phthysiologist for purposes of trial in genital tuberculosis of the female. JOHN W. BRENNAN, M.D.

Observations on the Delay Period in the Diagnosis of Pelvic Cancer. JOHN Y. HOWSON. *Med. Clin. N. America*, 1948, 32: 1573.

The author has reviewed 1,000 cases of pelvic cancer obtained from the files of the Committee for the Study of Pelvic Cancer in Philadelphia. In an analysis of the delay period it was found that there was a definite physician delay in 276, and a patient delay in 437 of the 1,000 cases. The greatest delay occurred in carcinoma of the vulva (27 months), and the shortest delay occurred in carcinoma of the cervix (from 7 to 8 months). The greatest factors in the physician delay were incorrect diagnosis and failure to examine the patient in the presence of pelvic symptoms. The reasons offered for the failure to examine the symptomatic patients were: presence of active vaginal bleeding, indiscriminate use of medication, failure to examine at first office visit, patient unprepared for pelvic examination, symptoms indicative of the menopause, and patient visited in the home.

In the examined case the delay was due to incomplete examination, incorrect diagnosis, or to wrong treatment following the making of the correct diagnosis.

The author concludes by stating that the early diagnosis of cancer can be facilitated only if the physician becomes more cancer conscious, and (1) examines all patients with pelvic complaints; (2) urges periodic examination of women over 40; (3) withholds treatment of pelvic complaints until diagnosis is made; (4) does pelvic examination at first office visit; (5) does complete examination, including use of the speculum; (6) examines patients who are actively bleeding; (7) refuses to treat patients who refuse examination; (8) studies suspicious cancer lesions relentlessly; (9) institutes proper therapy in the presence of known cancer; and (10) arranges for specific clinic or specialist care of cancer patients.

J. ROBERT WILLSON, M.D.

Biological Significance of Protein Concentration and the Changes Occurring in Gynecologic Laparotomies (Importanza e significato biologico del patrimonio proteico dell'organismo e suo comportamento nelle laparotomizzate ginecologiche). MICHELE GIARDINELLI and CAMILLO ROSSO. *Ginecologia*, Tor., 1948, 14: 340.

Determinations of proteins according to Phillips, and the Van Slyke method, of hematocrit values and of hemoglobin were made by the authors in 20 patients before and after laparotomies for obstetric or gynecologic conditions. All operations were performed under ether anesthesia.

The first 2 days after the operation the protein content of the blood serum, the hematocrit values, and the amount of hemoglobin rose. This increase undoubtedly was attributable to hemoconcentration.

Later on the hematocrit values and the amount of hemoglobin returned to their normal levels while hypoproteinemia was recorded in the majority of cases. As a rule, normal protein levels were reached toward the end of the first postoperative week.

During the pregnancy, especially in its terminal stages, the hematocrit values were found to be relatively low because of gestation hydremia.

Intravenous injections of protein hydrolysates proved very valuable in combating hypoproteinemia. JOSEPH K. NARAT, M.D.

On Sterility in Finnish Women with Special Reference to Its Causes and Prognosis. ALLAN VEHASKARI. *Acta obst. gyn. scand.*, 1948, 28: Supp. 5.

In the introduction of this treatise the author defines sterility as meaning that no impregnation has occurred. Infertility denotes that fecundation of the

ovum has taken place but that its regular development has been interfered with. Theoretically, these definitions are exact, but in practice it is often exceedingly difficult to differentiate one condition from the other. Physiological sterility is not considered in this study, nor is voluntary childlessness by contraceptive practices. Of pathological sterility there are different forms. If conception does not take place in spite of regular married life continued for several years, the term primary sterility is used. Sterility is considered secondary when, after one or more pregnancies, a woman loses her capacity for conception. The object of the present study is to examine the causes and the prognosis of sterility on the basis of the material collected from Finland.

In this investigation, the author used the term "primarily sterile marriage" to denote a marriage which has lasted at least 3 years without the occurrence of conception. A marriage is considered "secondarily sterile" if at least 4 years have elapsed since the end of the last pregnancy.

It is not possible to divide sterility into two distinct elements, namely, that due to the male, and that due to the female factor. Therefore, although the principal object of the present investigation is to deal with the causes and prognosis of sterility in women, it also touches some questions associated with male sterility.

The methods of examination are discussed by the author. When treatment was begun the average age of the patients in the present series was 32.2 years—those with primary sterility, 31.7 years and those with secondary sterility, 33.1 years. The average period for which married women with primary sterility had remained childless was 6.3 years. The average time elapsed from the end of the last pregnancy was 6.4 years in the case of the secondarily sterile married women. The average duration of sterility in all of the cases was 6.3 years. More than half of the patients with primary sterility had passed the optimal period of fertility when they were married. Breipohl expressed the opinion that a late menarche and irregularities at the first menses are likely to be of importance for the evaluation of fertility. He regarded the sixteenth year of life as the critical age of menarche in this respect. In the series reported herewith, the author observed that the prognosis of sterility seemed less favorable as the menarche was delayed. This decline, however, was so slight that there was a statistical difference only between the cases belonging to the earliest and the latest group.

By way of presenting the etiology of sterility, the author gives a tabulation in which the present series is divided into 6 main groups. The first of these, in which the vaginal factors were responsible, represented 1.6 per cent of the whole series. The group resulting from uterine factors amounted to 4.3 per cent. The tubal factors represented 45.4 per cent, endometriosis 8.5 per cent, and genital insufficiency, 29.5 per cent. The miscellaneous and unknown factors were represented by the sixth group which amounted to 10.7 per cent of the whole series.

The second of the two main objects of the present study was to investigate the prognosis of sterility. For this purpose, questionnaires were sent to such patients of the present series as were not under constant supervision. This method supplied information on the subsequent condition of 1,417 patients over a period of from 3 months to about 10 years. There was no information available on 273 cases, or 16.2 per cent, of the cases. As a result of this questionnaire, it was learned that 25.6 per cent of all the patients had become pregnant. It is significant that all of the patients revealed a less favorable prognosis as the age at which treatment was started increased. The most marked fall in the present series occurred at 3 years, which suggests that it is well to begin the treatment of sterility before the limit of 3 years, especially if the patient is elderly.

In the final summary the author notes that the object of the investigation herewith reported was to study the etiology and prognosis of sterility in Finnish women. The study was based on a series of 1,690 cases of sterility, 1,095 of which were primary and 595 secondary.

The sperm of the husband was examined in 821 cases, in 113 of which (13.7 per cent) azoospermia was revealed. These 113 were excluded from the series when female sterility was considered. Physical examination alone was carried out in 473 cases; hysterosalpingography in addition to it in 614 cases, insufflation in 164 cases, hysterosalpingography and laparotomy in 207 cases, and laparotomy in 232 cases.

The patients came up for observation at the average age of 32.2 years. The average duration of sterility was 6.3 years. In the present series, contraception did not seem to affect notably the duration of sterility. In cases of primary sterility, the patients' average age at menarche, 14.7 years, corresponded to the results of investigations recently carried out in Finland regarding the age at the menarche. The prognosis of sterility seems to show only a slight decline as the age of menarche increases. Of the patients with primary sterility, 15.7 per cent showed cyclical lability and 6.9 per cent cyclical debility. In the cyclically labile, the prognosis of sterility did not differ from that of the whole series, while in the cyclically debile the prognosis was worse.

The series was divided into 6 main etiological groups. Vaginal factors figured in 27 cases, or 1.6 per cent, of the series, and uterine sterility in 73 cases, or 4.3 per cent of the series.

In the largest etiological group, that for tubal sterility, (768 cases, or 45.4 per cent, of the whole series) examination of tubal permeability revealed tubal factors in 47.4 per cent, and physical examination alone in 40.0 per cent. Tubal sterility was considered as due to ascending infection in 37.7 per cent of the whole series. Of these cases, 3.1 per cent were due to gonorrheal infection, 10.6 per cent to infection following abortion, 5.9 per cent to infection following labor, and 18 per cent to other ascending infections. Tubal changes due to appendicitis were regarded as

responsible for sterility in 1.8 per cent of the whole series. In the present series genital or peritoneal tuberculosis appeared as a factor leading to sterility in 1.2 per cent. "Salpingitis isthmica nodosa" was considered responsible for sterility in at least 1.3 per cent of the series. Other cases of tubal sterility, which could not be placed into any of these groups, constituted 3.4 per cent of the whole series.

Endometriosis externa intraperitonealis was the probable cause of sterility in 8.5 per cent of the present series (143 cases). The surgically treated cases of endometriosis constituted 25.5 per cent of all the laparotomies. Intramural and isthmic tubal occlusions, possibly due to endometriosis tubae, appeared to be relatively rare in patients suffering from endometriosis, for only 8 of the 56 salpingographically examined patients with endometriosis externa showed such occlusions.

Genital insufficiency was considered responsible for sterility in 29.5 per cent (498 patients) of the whole series, in 35.5 per cent of the patients with primary sterility and 18.3 per cent of those with secondary sterility. In 72.5 per cent of cases in this group (361 patients with primary sterility) primary genital insufficiency was considered present. The incidence of genital infantilism and that of genital hypoplasia seemed to be roughly equal. Secondary genital insufficiency was considered responsible for sterility in 22.1 per cent (1 patient with primary and 109 patients with secondary sterility) of this group. In the remaining 5.4 per cent (27 patients with primary sterility) this subgrouping was not found to be feasible.

The last etiological group, in which the sterility was due to miscellaneous and unknown factors, constituted 10.7 per cent (181 patients) of the whole series. In this group, the 44 cases of posterior parametritis are worthy of mention.

Of all the patients in the present series, 25.6 per cent (432) became pregnant. The corresponding figure for the group with primary sterility was 25.6 per cent, and for those with secondary sterility, 25.5 per cent. In 25.4 per cent of those who became pregnant, treatment had lasted 2 years or more before pregnancy began. It was not until treatment had lasted more than 5 years that there was a marked fall in the favorable prognosis. This showed a steady decline as the age increased at which the patients were admitted for treatment. This decline associated with the lengthening of the period of sterility was most clearly seen at the 3 year limit.

Treatment in the two first etiological groups, (vaginal and uterine sterility) resulted in pregnancy in 45 per cent of the patients. In the group associated with tubal sterility, 13.2 per cent of the patients became pregnant, while 23 per cent of the patients with unilateral occlusion or impaired tubal patency, and 5.1 per cent of those with bilateral occlusion, became pregnant.

Of the patients with endometriosis, 32.9 per cent became pregnant. The prognosis in the secondarily sterile patients seemed to be better than that of the primarily sterile patients. In the group of patients with genital insufficiency, 31.1 per cent became pregnant.

Pregnancies occurred in 46.4 per cent of the women with sterility due to miscellaneous and unknown factors. Of the 44 patients with posterior parametritis, 26 became pregnant after treatment.

HERBERT F. THURSTON, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

An Ultimate Resort in the Diagnosis of Pregnancy. SVEN SJÖSTEDT. *Acta. obst. gyn. scand.*, 1948, 28: 167.

At laparotomy the gynecologist is occasionally confronted with an enlarged uterus which may be pregnant when prior to surgery there was no reason to suspect pregnancy. When this situation arises the surgeon (1) may close the abdomen and verify the diagnosis, (2) inspect the ovaries, looking specifically for a corpus luteum of pregnancy, (3) roentgenograph the mass at the time of surgery, (4) aspirate the uterine mass with a needle, or (5), as advocated, make an exploratory incision in the uterus.

Five cases of uterine exploration through a small incision were reported by Hellsten in 1917. In 1 case a cystic myoma was diagnosed, in 2 instances pregnancy, in 1 case hydatidiform mole, and in the last case the findings were misinterpreted and a pregnant uterus was removed.

The author reports on 3 diagnoses in which uterine incision was carried out. In the first case pregnancy was diagnosed after the exploratory incision was made. Subsequent pregnancy tests and roentgenograms did not verify this diagnosis and laparotomy revealed a myoma undergoing cystic degeneration. In the second case pregnancy could not be verified and, at laparotomy with a uterine incision, placental tissue was found. The uterus was sutured and the abdomen closed, but shortly after discharge the patient was readmitted for abortion. The last case was that of a patient who on laparotomy was found to have an ovarian fibromyoma plus a uterus irregularly enlarged to the size of a 4 months' pregnancy. Uterine exploration revealed placental tissue and the uterus was closed. Five months later the patient delivered a boy weighing 4.3 kgm.

The uterine incision must be adequate, at least 5 cm. long and from 1.5 to 2 cm. deep, in the midline and on the anterior aspect of the uterus. The risks of this procedure are slight and injury to the amnion can usually be avoided. The author recommends the utilization of this procedure in troublesome and puzzling cases. J. ROBERT WILLSON, M.D.

Two Cases of Pregnancy in Uterus Subseptus Unicorporeus and One Case in a Double Uterus (Dois casos de gravidez em útero subseptus unicorporeus e um em útero duplo). MARIA DOS SANTOS PINTO. *Rev. Port. obst. gin. cir.*, 1948, 1: 341.

One of the rarest congenital malformations of the female genital apparatus is uterus subseptus unicorporeus. In fact, the incidence of double formations increases with the height of the genital canal, double vaginas being rare, double uteri more frequent and bicornate uteri with a single cervix still more frequent.

The first case of uterus subseptus unicorporeus was observed in a woman of 22 years admitted during the ninth month of her pregnancy. Gynecologic examination revealed two vaginal orifices, the right one being the largest, and two noncommunicating vaginas, each with an independent softened cervix. The left fornix of the right vagina and the right fornix of the left vagina were smaller than those of the opposite sides. The right vagina easily allowed bidigital examination, but penetration of two fingers into the left vagina was difficult. During labor the contractions were of good quality and the fetus was unaffected. After spontaneous rupture of the membranes the fetal head was engaged, the orifices of the two cervices presented a dilatation of two fingerbreadths and the sutures and fontanels could be felt through each cervix. Under balsoforme anesthesia the vaginal septum was incised between two clamps, an incision was made uniting the two cervices, and the living fetus was extracted with forceps after a unilateral episiotomy had been performed. The puerperium was normal.

In the second case of uterus subseptus unicorporeus, observed in a woman of 29 years, the septum was thick at its points of implantation in the vagina and thin in its middle portion; it ran anteroposteriorly and separated the two vaginas completely. The cervices were partly flattened out but their dimensions, as well as those of the vaginas, did not allow delivery by the vaginal route. Therefore, low cesarean section was performed. A living child was obtained and the postoperative course was uneventful.

In the case of double uterus observed in another woman of 29 years, examination revealed that the vulva was divided by an anteroposterior septum and had two hymens, of which the left one presented no opening. The septum extended from the vulva to the uterus or uteri. The fundus of the left vagina presented a very small, softened cervix with nullipara orifice, and that of the right vagina a larger, softer cervix with the characteristics of a first pregnancy. In both fundi was felt a cephalic presentation which distended them. During labor the right cervix dilated and the left remained closed; the septum was displaced to the left but offered great resistance to the insinuation of the fetal head. When the cervix was completely dilated, the head was only slightly engaged and the fetus was suffering. Under spinal anesthesia the resistance of the septum was overcome by manual dilatation and a living child was extracted by forceps and the aid of an episiotomy. After delivery it was found that the septum had been torn in its entire length and also from the border of the cervices. Repair left one cervix at the fundus of a single vagina.

The two cervices gave access to two uterine cavities, one of which became pregnant, while the other increased slightly in volume. During labor the second

cervix underwent a beginning of dilatation and admitted one finger. In cases of double uterus the two cavities may become pregnant, but the pregnancy is then nearly always interrupted prematurely and the ova may be expelled at intervals of several months. Pains and bleeding may be observed, the first being due to uterine distention, the second to the hypertrophied decidua formed in the empty uterine cavity. If the wall of the pregnant uterine cavity has enough musculature, the pregnancy may go to term; otherwise, it ends in abortion or premature labor. The complications which may occur during labor in case of double uterus are due to the presentation, the modality of double uterus, the degree of elasticity and distention of the cervix and the vagina, and the degree of development of the uterine wall.

RICHARD KEMEL, M.D.

Extrauterine Pregnancy Exteriorized Through a Persistent Malpighi-Gartner Canal with Expulsion of Skeletal Remnants of the Embryo (Gravidanza extrauterina estrinsecatasi attraverso un persistente canale di Malpighi-Gartner con l'espulsione dei resti scheletrici dell' embrione). ICILIO PARDINI. *Clin. ostet.*, 1948, 50: 188.

A rare form of extrauterine pregnancy is the infraligamental type in which the ovum settles in the tube and the placenta develops on the lower wall of the tube where the villi destroy the muscular bundles and gradually reach the connective tissue of the mesosalpinx and the broad ligament so that the ovum becomes implanted secondarily in the connective tissue of the pelvis. Pardini reports the following case:

A woman of 24 years had her last regular menstruation on July 4. On October 18 she suddenly experienced severe abdominal pain in the right lower quadrant, persisting for 2 or 3 days. On November 4 she had slight sacrolumbar pain and a small loss of blood from the vagina. After a few hours she expelled a piece of fleshy substance which looked like an empty sac. Hemorrhage and pain then stopped. On November 19 she again started to lose blood, which for the first day had the characteristics of a menstruation, but then became blackish and mixed with fetid purulent material.

Examination disclosed at 1.5 cm. below and to the right of the urinary meatus a small opening from which issued the fetid blackish material. The uterus was of normal size and strongly displaced to the left. Through the right vaginal cul-de-sac could be felt a round mass, the size of an orange, nonmobile, in direct contact with the right side of the cervix and partially in front of it; the lower pole of the mass was in broad contact with the vaginal vault. A probe introduced into the orifice below the meatus was passed upward and slightly to the right, reaching the lower pole of the lateral mass. Vaginal palpation revealed under the mucosa a fibrous cord which ran to the right of the urethra, first upward and laterally, then straight ahead to be lost in the fornix close to and in front of the cervix. Lipiodol was injected through the orifice and the film showed that this canalicule communicated with the paracervical mass.

Two days later the orifice was occupied by a blackish, small foreign body which proved to be a rib of an embryo; then other bones were easily extracted from the canalicule and many were found on the dressing during the following 4 days. The secretion then became grayish, mucous, and gradually disappeared, while the mass was reduced to the size of a pigeon's egg, but the canalicule persisted in its entire course.

There is no doubt that the presence of the canalicule was due to the persistence of a Malpighi-Gartner canal: this was demonstrated by its course parallel to the urethra, its fibrous consistency, and the fact that no other organ can be present at this site during the embryonic stage and in adult life.

The death of the ovum could have occurred at two different periods in the history of the case: at the time of the severe abdominal pain and at that of expulsion of the decidua. The first would correspond to a pregnancy of 3.5 months, the second to one of exactly 4 months. Comparison of the collected bones with those of embryos in the anatomic museum of Pisa showed that they resembled more those of embryos of the fourth month; therefore, the interruption of the pregnancy must have coincided with the expulsion of the decidua.

Pardini advances the theory that the ovum became implanted in the mesosalpingeal part of the tubal ampulla; after perforating the tubal wall, it penetrated between the leaves of the broad ligament and approached the side of the uterus so as to come in contact with the canal of Malpighi. At this point, for reasons which cannot be determined but which were probably connected with defects in the blood supply, the pregnancy was interrupted and found the easiest way to the outside to be through the canal itself.

RICHARD KEMEL, M.D.

The High Occipital Position (Der hohe Geradstand). YNGVE MONTELL. *Ann. chir. gyn. fenn.*, 1948, 37: 250.

One of the rarest abnormalities of position of the fetus at birth is the high occipital position. In the material of the Women's Clinic of the University of Helsinki which comprised 68,584 births between 1924 and 1945, there were only 80 cases, or 0.12 per cent, of this type. The percentage of such cases in other years varied from 0 to 0.39. However, there is no doubt that the percentage of such cases is actually much higher and that many cases are overlooked in the presence of complications of labor. Among the etiologic factors the most important are the form and inclination of the pelvis, the size of the fetus, and the form of its head (flat roof of the skull), probably also the time of rupture of the membranes. In addition, there are many incidental causes, such as myoma, and a number of unknown factors. In many cases several factors are present simultaneously.

Two forms of high occipital position are distinguished: the pubic, in which the back of the fetal

head lies behind the symphysis, and the sacral, in which it lies in front of the promontorium. Most investigators accept the pubic form as more common, in the proportion of 3 to 1. In the present material, the sacral form was more frequent than the pubic form, the proportion being 2 to 1 (54 sacral cases as against 26 pubic). However, since spontaneous delivery occurred more often in the pubic form, the author thinks that in reality both forms are present with equal frequency. Although labor in the pubic form was somewhat longer than in the sacral, he considers the pubic form as more advantageous, not only because spontaneous births are more frequent but also because in eventual complications a low or semi-low forceps can ordinarily be used.

The treatment of high occipital position does not actually differ from that of other positions: if there is great disproportion, cesarean section is performed; otherwise, spontaneous birth is awaited. Of the 54 sacral cases, 21 (38.89 per cent) ended in spontaneous birth, 20 (37.03 per cent) in delivery by forceps, and 13 (24.08 per cent) in delivery by cesarean section. Of the 26 pubic cases, 11 (43.31 per cent) ended in spontaneous birth, 7 (16.92 per cent) in delivery by forceps, and 8 (30.77 per cent) in delivery by cesarean section.

In the sacral cases, 20 children (37.04 per cent) were born with the dorsoposterior position of the head, 19 (35.18 per cent) with the dorsoanterior position, and in the remaining 15 the position of the head was unknown. Of the 20 with the dorsoposterior position of the head, 11 (55 per cent) were born spontaneously. According to the literature, spontaneous birth of children in sacral cases occurs nearly exclusively in the dorsoanterior position of the head, i.e., the head rotates 180 degrees during birth. The position of the head was corrected in 2 cases although attempts at correction usually fail.

In spontaneous delivery of primiparas, labor was prolonged for both forms: in the pubic form it lasted 32.5 hours (31 for the first phase and 1 for the second phase); in the sacral form it lasted 29.3 hours (26 for the first phase and 3.3 for the second phase). There were no maternal deaths and only 2 (2.5 per cent) among the children. RICHARD KEMEL, M.D.

Diethylstilbestrol in the Prevention and Treatment of Complications of Pregnancy. O. WATKINS SMITH. *Am. J. Obst.*, 1948, 56: 821.

This study of the clinical evaluation of diethylstilbestrol therapy in human pregnancy is based on the analysis of 632 pregnant patients treated by 117 obstetricians according to the recommendations of the author as to the dosage schedule. These patients included ward and private patients and as to their residence represented a cross section of the United States with its varied climatic conditions, dietary variations, geographic distribution, and general obstetric care.

The basis for the use of this drug is that, in the dosage prescribed, stilbestrol has the ability to stimulate a greater production of the placental steroid hormones and thus increase progesterone metabolism.

Therefore, stilbestrol should prove beneficial in any abnormal situation of pregnancy in which progesterone deficiency may be etiologically involved, provided the cells which secrete the steroid hormones are still capable of functioning. That progesterone deficiency might result in abortion and premature delivery has been established. It has also been shown that a progressive deficiency of the steroid hormones invariably precedes the onset of late pregnancy toxemia, eclampsia, and intrauterine death. A reciprocal relation exists between the vascular supply to the placenta and the circulating level of the steroid hormones. By combating a deficiency of estrogen and progesterone, vascular damage might be prevented, so that hormonal therapy might be of value in twin pregnancy, essential hypertension, and in the prevention of vascular complications. The use of stilbestrol for the treatment of late pregnancy toxemia, as opposed to its prophylactic use, is not advised since the vascular damage is already so advanced that the increased secretion of progesterone cannot be stimulated.

The dosage schedule is that of 5 mgm. daily by mouth started during the sixth or seventh week. It is increased by 5 mgm. at 2 week intervals to the fifteenth week when 25 mgm. are given daily. The daily dosage is then increased by 5 mgm. at weekly intervals. The drug is discontinued at the thirty-fifth week. For the prevention of late pregnancy accidents stilbestrol is started not later than between the sixteenth and nineteenth weeks. The initial dose is always the one for the particular week of pregnancy when therapy is begun.

Of 491 patients treated for bleeding between the sixth and twenty-first weeks of gestation (threatened abortion and abortion prophylaxis) 78 per cent carried to the twenty-eighth week, and 72 per cent had living babies. In 127 patients who had from 2 to 5 consecutive abortions prior to therapy the fetal salvage was 77 per cent.

For the patients with late pregnancy complications (24) this report is of a preliminary nature. The author believes that this prophylactic treatment has reduced the incidence of complications associated with deficiencies of the steroid hormones.

Only 9 patients (1.4%) reported toxic reactions such as nausea, headache, vaginal discharge, and skin rash. JOHN R. WOLFF, M.D.

Acute Operative Intestinal Complications in Connection with Pregnancy. HANNES SAURAMO. *Acta obst. gyn. scand.*, 1948, 28: 150.

From 1921 to 1947, 8 patients suffering with acute operative intestinal complications associated with pregnancy were observed at the Womans Clinics 1 and 3 at the University of Helsinki. The incidence was 0.01 per cent. The author reviewed these cases thoroughly and found that the etiological factors were: strangulation plus adhesions, strangulation plus Meckel's diverticulum, strangulation plus a

mesenteric foramen, volvulus of the sigmoid colon, occlusion plus foreign bodies in the abdominal cavity, incarcerated umbilical hernia, invagination plus Meckel's diverticulum, and paralytic ileus after cesarean section.

Ileus during pregnancy usually occurs at term or during the first few days of the puerperium.

The maternal mortality rate was 25 per cent, the fetal mortality rate 37 per cent, and the reduced fetal mortality 0 per cent. Ileus appeared in association with pregnancy in the proportion of 1 to 8,000.

The author, on the basis of anatomical investigations on the recess formations in the peritoneum in 100 of his own cases discusses the possibilities for the development of internal hernia and gives the frequency rate in per cent.

Thirteen cases of appendicitis occurring during pregnancy were also reviewed by the author, and he states that appendicitis is much more frequent than ileus in association with pregnancy, and that the diagnosis and treatment are often difficult. There were 2 deaths in the series, both associated with perforated appendixes. The tendency toward abortion and premature labor and delivery was seen most frequently in the cases of perforated appendix and spreading peritonitis.

The maternal mortality rate was 15 per cent, and in 23 per cent of the cases the death of the infants was directly attributed to the appendicitis. The incidence of operative appendicitis in pregnancy is 0.02 per cent and the distribution of the cases is equal for all the months of pregnancy.

J. Robert Willson, M.D.

LABOR AND ITS COMPLICATIONS

The Clinical Use of Sodium Vinbarbital by the Intravenous Route in Obstetrics. Louis G. Fournier. *Am. J. Obst.*, 1948, 56: 913.

Sodium vinbarbital was administered to 500 unselected private patients during labor and at delivery at the St. Joseph's Hospital, Syracuse, New York. This was the only anesthetic used in one-half of the cases, while in the other half it was combined with other agents.

An initial dose of 10 gr. was given intravenously as soon as the cervix was completely dilated. Subsequent doses of 5 and 10 gr. were added when restlessness occurred with uterine contractions.

Complete amnesia and analgesia were obtained in 99.4 per cent of the patients. Uterine contractions were unaffected and hemorrhage did not occur.

No fetal death could be attributed to the use of this drug. There was no maternal mortality.

John R. Wolff, M.D.

NEWBORN

Chondrodystrophy Fetalis. Edith L. Potter and V. A. Coverstone. *Am. J. Obst.*, 1948, 56: 790.

There have been 2 instances found in the literature in which father, mother, and child were chondrodystrophic dwarfs. The present case report brings the total to 3.

Cesarean section is always indicated for the delivery of a pregnant chondrodystrophic woman because of the pelvic deformity constantly associated with this condition.

The prognosis for survival of chondrodystrophic infants should be guarded.

Chondrodystrophic children, for the most part, appear in families in which both the father and mother are normal. The condition seems to be inherited as a simple, dominant, mendelian character complicated by (a) mutations which occur more frequently than has been generally recognized, and (b) "skipping phenomena." John R. Wolff, M.D.

MISCELLANEOUS

Classification and Etiology of the Functional and Organic Disturbances of Pregnancy (Gestoses). Hannes Sauramo. *Acta obst. gyn. scand.*, 1948, 28: Supp. 4.

Disturbances which occur during pregnancy should be classified.

The terms toxemia and nephrogestosis are misleading. According to the author, the term "gestosis" seems to be the best one used thus far. "Dysgraviditas" has been used by some (Pigeaud and Dumont, 1946). The classification used in the United States is the one suggested in 1940 by the American Committee on Maternal Welfare.

Classification of the disease picture is not always possible until up to one-half year or a year post partum.

The disturbances of pregnancy are thus classified by the author:

1. Gestosis neurovegetativa (chiefly hyperemesis)
2. Gestosis hypertensiva (essential hypertension)
3. Gestosis pura acuta (constitutional inferiority)
4. Gestosis chronica (acquired chronic disease)
5. Incidental disease during pregnancy

To the indifferent term "gestosis" the most characteristic feature in each group is annexed, viz., (1) ptyalismus, emesis, hyperemesis; (2) levis, gravis, maligna, eclampsia; (3) proteinuria, eclampsismus, eclampsia, eclampsia sine convulsione, eclampsia sine proteinuria, hepatogestosis; (4) nephrosclerosis, glomerulonephritis chronica, nephrosis chronica, pyelonephritis chronica, eclampsia, cirrhosis hepatis; and (5) hepatitis epidemica, pyelitis acuta, pyonephrosis, glomerulonephritis acuta, nephrosis acuta.

The material in this article deals with pregnancy disturbances observed during a period of 1 year in 3,500 gravidae.

From a study of this material the following facts are derived:

Gestosis neurovegetativa is a functional feature of the organism's attempt to adapt itself to pregnancy in the placental phase. Its most common type is emesis and hyperemesis. Severe hyperemesis is in general complicated by some other disease or

psychic disturbance. Gestosis neurovegetativa may appear in any pregnant woman, and when appearing in the pure type it disappears within the first 3.5 months of pregnancy. Thereafter its disappearance depends upon other diseases associated with it.

Gestosis hypertensiva is a functional disturbance during pregnancy due to congenital essential hypertension. It may develop regardless of parity. The patients have often had tonsillitis and glomerulonephritis. Symptoms may occur at any time during pregnancy. Cardiovascular affections are often observed. Occasionally proteinuria occurs. Hypertension often persists after delivery. The fetal mortality rate is low.

Gestosis pura acuta is a congenital functional disturbance during the last trimester of pregnancy due to the inferiority of the organism. It occurs usually in primiparas. Edema and proteinuria are almost always present. Eclampsia frequently develops and recovery is rapid after delivery. Big children are unusual. Maternal and fetal mortality occurs. Uteroplacental apoplexy is encountered. An obvious change in hematocrit and alkali reserve values is observed. Gestosis pura acuta, or sudden pure pregnancy disturbance, actually known to the obstetrician as toxemia of pregnancy, is due to over-exertion caused by pregnancy in a functionally inferior and obstetrically underdeveloped gravida. The consequences are balance disturbances of the organism, abnormal products of metabolism or their appearance in too great quantities, as well as hormonal and enzymatic disturbances, which are secondary consequences of over-exertion and tissue anoxia. The chief congenital reason, i.e., an inferior organism, leads to over-exertion, anoxia, and to all the numerous changes in the organism.

Gestosis chronica is a disturbance during pregnancy due to an acquired organic illness. It is more frequent in multigravidae. These patients have frequently had infectious diseases. The symptoms may appear at any time during pregnancy. Edema and proteinuria generally occur. Cardiovascular disturbances are often seen. Eclampsia frequently develops and the symptoms often continue until after delivery. The children are small and the fetal mortality is high. Uteroplacental apoplexy is often encountered.

Under incidental illnesses during pregnancy, the complications that may occur have been listed previously.

When "gestosis" patients are kept under observation attention should be paid to the following: (1) hypertension, (2) edema, (3) proteinuria, (4) the urinary sediment, (5) the quantity and specific gravity of the urine, (6) weight, (7) retinal changes, (8) cardiovascular affections, (9) hematocrit, and (10) the alkali reserve of the blood.

In the treatment of patients with gestosis the author mentions methods generally agreed upon at present. It is suggested that the internist, ophthalmologist, and psychiatrist should be consulted freely. HARRY FIELDS, M.D.

Habitual Abortion. ROSCOE L. WALL, JR., and ARTHUR T. HERTIG. *Am. J. Obst.*, 1948, 56: 1127.

The present study is based upon the pathologic analysis of abortion specimens from 100 women having two or more abortions before the twenty-eighth week of pregnancy at the Boston Lying-In Hospital, Boston, Massachusetts.

The same etiological factors were present individually in 58 per cent of the cases: 43 per cent of abortions were due to ovular factors, and 15 per cent to maternal factors. Pathologic ova were found to be the commonest cause of habitual abortion.

The findings would seem to warrant a revision of the approach to the clinical problems involved in habitual abortion. It is important that a specimen of the first abortion be thoroughly examined pathologically. Determination of the causative factors in the first abortion may point to treatment that will prevent a second one. JOHN R. WOLFF, M.D.

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Studies on Backflow in Excretion Urography. OLLE OLSSON. *Acta radiol.*, Stockh., 1948, Supp. 70.

At an early date, anatomists observed that material injected into the ureter escaped through the vena renalis. The first mention of this phenomenon to be found in the literature seemed to be that made by Gigon in 1856. With the introduction of retrograde pyelography (1906) the anatomical reconstruction method was reproduced clinically, whereby the phenomenon won clinical significance. In reviewing the experimental work reported in the literature Olsson states that, even in retrograde pyelography, this important and interesting phenomenon peculiar to backflow has not been sufficiently investigated.

In contrast to the amount of literature on the subject of backflow manifested in retrograde pyelography, the published reports of backflow discerned in excretion urography are but scanty. In an extensive material study, greater than any previously published study, the author elucidates certain questions bearing on backflow, especially in association with excretion urography. A description of the roentgenological anatomy of different types of backflow, their development and frequency in urographic material, is given.

The clinical material consisted of 100 intravenous urographic examinations exhibiting backflow. The examination technique adopted was that suggested by Hellmer, a description of which was published in 1943.

These cases of backflow were discovered by the author while perusing 1,500 urograms chosen at random for purposes of elucidation of the frequency of backflow in his material of excretory urograms.

The only mention of the frequency of backflow in excretion urography is that made by Lindbom (1943). In a perusal of 2,600 urograms, 15 cases of backflow (1.6%) were found among 900 cases in which ureteral compression had been applied. Among the author's 998 cases in which ureteral compression had been applied, the backflow phenomenon was exhibited in 2.5 per cent. In excretion urography with ureteral compression the visualization of backflow is by no means a rare phenomenon. In 98 of 100 urographic examinations, extravasation did not occur until after the application of very careful and prolonged ureteral compression.

Of greatest interest are the type and course of individual cases of backflow. These cases fall into two distinct groups: (1) the extravasate has the form of streaks or lines extending more or less regularly and medially from the kidney towards the spine; (2) the radiopaque extravasate is localized immediately adjacent to one or more calyces, from where it spreads in the sinus renalis, around the renal pelvis and its branches, and possibly out through the hilus. This group comprises 89 of the 100 cases under discussion.

The force with which the extravasate spreads in the course of excretion urography may be in most cases but little. In some cases the active contraction of the renal pelvis may now and then be assumed. Such a contraction of the renal pelvis may give rise to an abrupt increase in the intrapelvic pressure, as well as to a change in the form of the fornix calyces which become more acute. Such a change favors the development of backflow.

With a view of ascertaining to what degree the designation of the term "pyelovenous" was justified, the author by experimental examination concluded that (1) backflow appearing in the radiograms as small fornix extravasates have no connection with the circulatory system; (2) backflow of the types most commonly observed in excretion urography is limited to the sinus renalis and does not involve an "injection" of urine into the circulation; (3) under vital conditions the tendency of the extravasate to spread to the blood vessel is less than in postmortem specimens; and (4) the term "pyelovenous backflow" for the designation of small sinus extravasate is not motivated.

The author suggests that on the basis of a thorough knowledge of the roentgenological anatomy, the various types of backflow should be designated:

solitary multiple general	rupture with	little medium profuse	overflow sinus extravasate

The clinical significance of backflow was considered by Olsson from the viewpoint of demonstrating how particular pathological conditions have a tendency to produce backflow, and to ascertain whether clinical changes can be brought about by backflow.

Distention of the renal pelvis is a condition that is necessary for the development of backflow. The author cites the case of an expansive process associated with a kidney tumor in which backflow was present. This phenomenon may be of differential diagnostic significance in renal tuberculosis and in acute renal colic as well as in kidney tumor.

The author reported 6 cases in which large radiopaque extravasates were discernible during the course of acute urography. These patients were examined very shortly after the onset of colic and the urogram was performed during the acute attack of pain, without any preparation of the patient.

The significance of backflow in this type of case from a roentgenological point of view is purely diagnostic, but from a physiopathological point of view the condition constitutes a sign of gross decompensation between the outflow of urine and the increase in intrapelvic pressure that exists during an acute

phase of renal colic. The contrast backflow begins so early that there is reason to believe it has already existed prior to the urographic examination. From his observations the author concluded that backflow, even profuse backflow, may occur in association with acute renal colic, and this backflow may constitute an integral part of the picture clinically, physiopathologically, and diagnostically.

The most common type of backflow observed in the course of excretion urography is the small sinusal extravasate. The type of backflow in which filling of the lymph channels and venous vessels may be visualized roentgenographically is relatively rare.

Experiments have shown that no short circuit exists between urine and blood in backflow of the type most common in excretion urography. Backflow should be termed according to its roentgen-anatomical extension; for example, fornix-sinus backflow, sinus lymph channel backflow, etc. The greatest significance of backflow is its diagnostic and differential diagnostic value in conditions such as tuberculosis, renal rupture, renal tumor, and acute renal colic. CONRAD A. KUEHN, M.D.

The Indications and Results of X-ray Examination in Trauma of the Kidney (Les résultats et les indications des explorations uro-radiologiques dans les traumatismes des reins). TRUC and BRINGER. *J. urol. méd.*, Par., 1948, 54: 305.

The clinical diagnosis of renal contusions and, in particular, severe ones does not offer great difficulty. The symptomatic triad of the general physical condition along with the urinary and local findings are sufficiently characteristic to establish the diagnosis. But in slight traumas or those of medium severity, it is not always possible to determine with certainty if there is a renal lesion, and it is also difficult to determine the extent of the renal damage.

Urologic examination does not always provide information of value. If cystoscopic examination can be carried out, the site of the bloody urinary ejaculations can be determined. Sometimes it is impossible to do this immediately after trauma because the patient is in shock.

Roentgenological examination permits the exact evaluation of the renal trauma. The only contraindication to this procedure is the severity of the trauma and the state of shock of the patient. When the trauma involves the kidney structure, immediate surgical intervention may be necessary. All injuries of the kidney should be studied from hour to hour and a roentgenological examination should always be made.

A flat film of the kidney region will demonstrate the renal silhouette or perhaps widening of the renal shadow. There may be a deformity or absence of the psoas shadow. The absence of motility of the kidney and the excursions of the diaphragm can also be shown. Associated lesions, such as fractures of the ribs, are readily demonstrated. These findings are not pathognomic of trauma of the kidney, but they do have clinical significance.

The flat x-ray picture sometimes reveals stones that have not previously been suspected. The author cited a case of a 250 pound man who suffered a contusion to the right kidney region. He became anuric. Examination on the third day of the anuria showed a shadow that suggested a ureteral stone. After ureteral catheterization and relief of ureteral spasm by infiltration of the renal pedicle with novocain, there was a copious diuresis. Two small ureteral stones were then evacuated.

Retrograde pyelography in renal rupture may or may not be advisable, for it may aggravate hemorrhage or produce severe secondary hemorrhage. Infection may also be introduced into the kidney, and diffusion of the contrast media through the injured kidney may carry with it infectious organisms.

From many articles and numerous observations, it has been established that precise information from intravenous pyelograms has been obtained without infection or without initiation of secondary hemorrhage.

A retrograde pyelogram furnishes exact information and at times it is superior to that of the intravenous method. By the observation of strict aseptic technique, the danger of infection in retrograde pyelography is reduced to a minimum, but the risk still exists. The second objection to retrograde pyelography is the possibility of recurrence of a severe secondary hemorrhage that may be the direct result of the examination. The author stated that while the retrograde pyelograms give valuable information in early cases of renal trauma, the results are subordinate to those obtained by intravenous urography. If the renal trauma does not necessitate surgical intervention, and if the lesion heals with cicatrization, ascending pyelography after healing takes place may give useful and definite information as to the condition of the previously injured structures. Pyelograms made at this time may be useful too from a medicolegal point of view.

The intravenous pyelogram shows the physiology of the kidney and, at the same time, the renal function. If the information given by the intravenous method is not complete, it must be supplemented by the retrograde method; but it can satisfy the urologist concerning the condition of the injured patient and at the same time give information as to the existing morphology and pathology of the kidney.

Elimination by the injured kidney of the opaque substance presents certain advantages. It does not further traumatize the kidney and does not mobilize the clots that distend the fissures; neither does it aggravate the lesion or lead to infectious accidents.

In renal trauma intravenous urography permits a determination of the extent of the kidney lesion and helps to evaluate its severity. In certain cases it gives information concerning the renal parenchyma and the urinary passages. Insufficient blood supply may cause a poor excretion of the contrast media, or even the total lack of excretion on the contused side. If this is the case, early retrograde studies are indicated when the patient is no longer in shock.

When there is a recurrence of the hemorrhage accompanied by signs of severe blood loss and the hemorrhage is progressive in character, immediate lumbotomy is indicated. This operation allows for the suture of the ruptured kidney or, if necessary, a nephrectomy may be done if the renal parenchyma is injured beyond repair.

In case of severe injury, a flat x-ray film of the kidney, ureter, and bladder should be taken and an immediate intravenous urogram made at the same time. This x-ray examination will demonstrate the absence of trauma or the extent of trauma that is present. In cases of nonelimination of the contrast media by the contused kidney, the preoperative retrograde pyelogram gives valuable information.

If the patient is not in shock, he should be closely observed (temperature, pulse, blood pressure, condition of the lumbar fossa, and blood count). Cystoscopic examination may determine which side the blood is coming from; and whether the injury is minimal or both sides are involved, early intravenous urography gives a complete picture showing the functional state of the uninjured kidney and the condition of the injured kidney as well. It is possible to make a diagnosis whether the lesion is limited to the renal parenchyma, the pelvis, or whether the capsule is involved along with the pelvis and the calyces. The author makes a retrograde pyelogram if the intravenous urograms do not show elimination by the contused kidney.

The author concludes that roentgenography of the urinary tract and venous urography are indispensable in the examination of those patients who have suffered lumbar trauma. If the intravenous urograms show only diminished elimination of the opaque media on the contused side or there exists a slight alteration of one of the calyces, the patient usually recovers without surgical intervention. If the urogram shows a perirenal hematoma on the contused side, surgical intervention should be used only if it becomes absolutely necessary; otherwise, the treatment should be conservative. If the intravenous pyelogram shows no elimination of the radiopaque substance on the contused side, retrograde pyelography may give exact information as to the condition of the kidney. Surgical intervention in this type of case may be necessary. In case of very severe hematuria with perirenal hematoma which is progressive in character, the clinical signs determine the course to follow. In cases of renal contusions that are healed by conservation of the kidney, the intravenous and retrograde pyelograms give information concerning the secretory, excretory passages, and the morphology of the kidney. This procedure will also give valuable information in medicolegal cases.

CONRAD A. KUEHN, M.D.

Intravenous Urography and Retrograde Pyelography in Subcutaneous Injuries of Kidney. A. STEINBOCK. *Ann. chir. gyn. fenn.*, 1948, 37: Supp. 4.

Steinbock reported on the results of excretory and retrograde urographic examinations of 37 fresh cases of, and 54 cases of old recoveries from, renal rupture. Intravenous urography may be resorted to early after injury provided the patient's general status permits it; positive findings render retrograde pyelography unnecessary. The latter may be performed in urgent cases prior to operation if operative intervention is decided upon on the basis of the clinical symptoms.

Intravenous urography is considered a harmless diagnostic procedure. It significantly establishes the existence and function of the opposite kidney, thus preventing the fatal removal of a solitary kidney. Two instances of solitary kidney were encountered among the author's 37 cases of fresh renal trauma. In 13 of these 37 cases the pyelogram was normal; filling deficiencies and intrarenal injury, each, were encountered 5 times and the contrast medium diffused perirenally 11 times. The causes of error in intravenous urography for fresh renal trauma are meteorism, blood clots in the renal pelvis, a sudden fall of the blood pressure, and shock. Shock usually contraindicates excretory urography.

Steinbock believes that retrograde pyelography requires perfect asepsis and slow injection, which may be advantageously followed fluoroscopically. He has never observed any harm from retrograde pyelography performed under aseptic conditions.

The foregoing diagnostic procedures are of great value, but are not absolutely decisive in determining the indications for operation. As a rule a fresh renal rupture seldom requires surgical intervention. Of the 37 patients only 4 were operated upon (2 nephrectomies, 1 pseudohydronephrosis incision, and 1 hydronephrosis suture were performed).

Fifty-four patients were examined several years after the occurrence of renal trauma. The pyelogram was normal in 40 of these patients, including 1 patient with rupture of the kidney and pelvis which had been sutured.

The article is concluded with a comprehensive bibliography and a short report of a case of incomplete rupture of the wall of a ureter. In the region of the ureteral tear there occurred extravasation of urine forming a large mass. In this instance excretory urography performed 3 days after the trauma failed to reveal the lesion because of the absence of renal excretion of the contrast medium on the injured side. However, retrograde urography performed 3 days later showed the site of ureteral rupture.

ROBERT TURELL, M.D.

Diagnostic and Therapeutic Considerations of Horseshoe Kidney (Riñon en herradura. Consideraciones diagnosticas y terapeuticas). A. E. GARCÍA, A. ROCCHI, J. CASAL, and A. I. GUINEA. *Rev. argent. urol.*, 1948, 17: 133.

Eight cases of horseshoe kidney are presented, a percentage occurrence of 4.745 over an 8 year period of urologic service at the Hospital Espanol. Four of the patients were treated surgically.

The so-called pathognomonic symptoms were observed in only 1 instance, for which reason it is be-

lieved that the classic syndrome of horseshoe kidney is less frequent in occurrence and by itself does not justify a diagnosis. Urography is considered the most important single fundamental step in diagnosis. Treatment must be based on two factors, the pathologic process in the isthmus and the associated kidney lesions. STEPHEN A. ZIEMAN, M.D.

Kidney Tumors (Tumores do rim). GUERREIRO DE FARIA. *Hospital*, Rio, 1948, 34: 699.

The histopathology, diagnosis, and therapy of kidney tumors are discussed by the author. Numerous photographs and photomicrograms illustrate the article. The following classification of kidney tumors is offered by the author:

1. Tumors of the renal parenchyma
   a. Epithelial tumors: adenoma, carcinoma
   b. Tumors of the connective tissue: benign, such as lipoma, fibroma, and myoma; and malignant, sarcoma
   c. Embryonal tumors: benign, dermoid; malignant, dysembryoma (Wilms tumor)
   d. Tumors of the suprarenal gland: hypernephroma or Grawitz tumor
2. Tumors of the renal pelvis
   a. Epithelial: benign, papilloma; malignant, carcinoma
   b. Tumors of connective tissue: benign, lipoma, fibroma, and myxoma; malignant, sarcoma

The author advocates postoperative x-ray treatment, which is also indicated for palliation in cases in which a surgical procedure is contraindicated.

JOSEPH K. NARAT, M.D.

Injury of the Vena Cava during Nephrectomy (Blessure de la veine cave pendant la néphrectomie). A. PUIGVERT GORRO. *J. urol. méd.*, Par., 1948, 54: 349.

Among the many accidents one sees that occur during nephrectomy, without doubt, the most dramatic is the accidental opening of the inferior vena cava by a sharp cutting instrument or laceration by traction on another vein. This serious accident fortunately is rare; one sees it chiefly on extirpation of the right kidney. The author stated that twice he has been the actor in this dramatic event.

The first case of operative injury to the vena cava was reported by Lucke in 1880 (a nephrectomy for sarcoma, through a transperitoneal approach). Lucke was able to place ligatures on the lateral wall of the vena cava and he packed a tamponade into the lumbar fossa. The patient died on the fourth day of uremia. The autopsy showed that the wound of the vena cava was an opening about a centimeter in length, and that it had been occluded by compression since the ligatures of catgut that he had thought to be in place over the opening in the vein were fixed in the vicinity without occlusion of the vessel.

In 1892 Schede for the first time performed a lateral suture of the inferior vena cava with success, but his patient died of cancer 15 days after operation.

In 1893 Marconi, assistant to Professor Bottini, published the report of a case in which the inferior vena cava was sectioned, and in spite of this healing of the vein below the origin of the renal vein was obtained. Bottini marked a step in the history of venous surgery, for he proved experimentally that animals could survive following total ligation of the inferior vena cava at a level that was compatible with life.

Houzel in 1901 performed the first voluntary ligation of the vena cava during the course of nephrectomy. It was then learned that patients could survive this serious accident of ligation of the inferior vena cava.

While some authors obtain success by tamponage of the injured veins, others place hemostats to occlude the opening. A few surgeons practice lateral ligation of the vessel wall while others ligate the vein. However, most of these cases are handled by lateral suture of the vena cava.

While opening of the vena cava is usually accidental, in some cases—as that of Zoege von Manteuffel—the vein was deliberately opened. The author audaciously opened the vein about 10 cm. to extract an extension of the neoplastic growth that had its origin in the kidney. He sutured the wall of the vena cava and the patient recovered.

Opening of the vena cava is usually accidental and occurs during the enucleation of an enlarged kidney with marked perirenal and perihilar adhesions. It is on freeing these adhesions and dissecting the hilar glands in order to facilitate the dissection that openings into the vena cava or the renal vein, as it emerges from the vena cava, are produced.

In some cases the injury is produced by tearing an enlarged kidney or by tearing the pedicle when traction is put on a large pedicle to elevate the kidney. Some injuries occur during clamping of the pedicle, and in other cases there is so much stretching of the elastic wall of the vena cava with subsequent slipping of the ligature that the vena cava is opened.

In the author's first case, that of a calculous right kidney that was bound down by dense adhesions producing a block of fibrosclerotic tissue, he encountered great difficulty in freeing the pedicle. Preliminary liberation of the ureter from the lumbar fossa was attempted in order to approach the vascular pedicle. During this manipulation of the kidney, the vena cava was torn. A lateral opening 1 cm. in length was made. The bleeding was very severe and the operative field was immediately inundated with blood. A large pack was maintained for several minutes, and when the pack was being removed the hole in the lateral wall of the vessel was seen and two clamps were placed on the wall so as to form a V. In this way, he obtained hemostasis. Then the kidney was removed. Because of the elasticity of the vena cava and the small size of the hole, the lateral wall was sutured below the two previously placed hemostats.

In the second case the patient had a large congenital hydronephrosis. Following the manipulation and freeing of this large sac that was adherent to the lateral border of the vena cava, the wall of the vessel was opened and a gush of venous blood occurred.

The accident was extremely hazardous, and instantly the operative field was inundated with blood. Compression by a gauze pack was established. When the gauze pack was slowly raised, the surgeon saw the longitudinal hole in the vena cava which was immediately closed by two hemostats. Because of the good result obtained by ligature in the previous case, it was thought advisable to close the rent. This was possible after a first vain attempt was made. He protected the suture line with a gauze pack and proceeded with the extirpation of the kidney. The patient had an uneventful convalescence as if the accident had not occurred. Catgut ligatures were used in both cases.

When injury to the vena cava is controlled by clamping, lateral ligature, suture of the vein, or tamponage, the level of the injury is not of importance. But when the vena cava must be ligated to control hemorrhage, the ligature must be placed below the opposite renal vein, for the great anastomosis of the efferent system of perirenal veins, the renoazygos-lumbar venous system, provides the return circulation of the remaining kidney. The experience of many surgeons has shown that death occurs when the ligature is placed above the renal veins of the remaining kidney. On the contrary, when the ligature is placed below the renal veins of the remaining kidney, this procedure is well tolerated, and the circulation is re-established by the azygos veins, by the extrarachidic system of veins, by the venous anastomosis of the abdominal wall as well as by the spermatic or ovarian veins.

Lumbar packing has been used with success in some cases. Colombino removed a tamponade 6 days after the operation and obtained healing. Many authors believe that clamping of the vena cava and packing are the methods of choice when lateral ligature of the wound is impossible.

Cabot utilized a hemostatic clamp in 1 case and left it in place for 7 days. Gayit considered that subsequent thrombosis occurred with the same frequency when the hemostatic clamp was correctly placed, as when the suture method was used.

Pasteau considered that suture for the repair of injury to the vena cava was the best procedure. He considered packing an uncertain method of hemostatic control. Clamping of the venous wound was a rapid and usually easy procedure if the clamps were well placed. From his experience Pasteau believed that the clamps should be left in place for 4 days following surgery, and when this was done he obtained excellent results. In spite of the opinion held by Pasteau, some authors do not fully agree with him, but they believe that clamping of the opening in the vena cava is rather a method of necessity imposed by the attenuating circumstances.

In summary, the author uses gauze packing with pressure against the opening in the inferior vena cava from 5 to 7 minutes. By carefully removing the pack, the tear in the lateral wall of the vein may be seen quickly and clamps without teeth can be applied. He advises that clamps be applied in a V position; then the injury can be repaired with either fine intestinal type catgut or linen sutures. It is prudent to leave a gauze wick in contact with the venous opening to provide a means of controlling the return of the blood flow or as a hemostatic tamponage.

CONRAD A. KUEHN, M.D.

Ureterointestinal Implantation and Total Cystectomy for Cancer (L'implantation urétéro-intestinale et la cystectomie totale pour cancer). HENRI GODARD. *J. urol. méd.*, Par., 1948, 54: 313.

In the past years ureterointestinal implantation has benefited by numerous improvements, the work of the American surgeons, Coffey, Higgins, Hinman, Poth, Mayo, and others.

In spite of undisputed progress, the technique of operation is not completely standardized since there are at least three modifications of the Coffey method in addition to other techniques published in the literature from abroad.

The choice of operation for cancer of the bladder is made after evaluating the patient's general health, the local pathology, and the personal preference of the surgeon.

The opponents of ureterointestinal implantation base their opinion upon the hazards of surgical intervention (peritonitis and ileus) and the renal complications of postoperative suppuration (pyelonephritis and pyelonephrosis). However, urologic surgeons believe that there will be a decrease in the frequency of these complications as the problem receives further study.

The author cites the opinion of Kirwin (*Surg., Gyn. Obst.*, 1938, 66: 998) who suggested partial cystectomy with destruction of the tumor by electrocoagulation with or without radium implantation as the treatment of choice in bladder cancer. After his experience with 3 cases, the author concluded that this method was not a satisfactory one, "for how can one accomplish the destruction of the tumor by partial cystectomy or by electrocoagulation without exposing the patient to the great risk of recurrence."

Some good results have been obtained with x-ray and radium therapy. However, radiation therapy is difficult to administer in the proper dosage. It tends to accentuate the cystitis and in itself is not without danger.

Contact radiotherapy too has produced some good results. Darget and Duvergey treated 3 patients with large bladder tumors by contact radiation in doses of from 8,000 to 16,000 roentgen units with good results, lasting from 6 to 13 months.

If similar results are published, one might be inclined to consider this method of treatment for all tumors of the bladder. Actually, however, it is difficult to evaluate this method because it is not easily administered. It may be the method to use when it is impossible to do a total cystectomy. The author reviewed the work of Higgins (*Surg. Gyn. Obst.*, 1938, 66: 549) on total cystectomy and transplantation of the ureters into the intestines for cancer of the bladder. Higgins concluded that total cystectomy with

intestinal transplantation of the ureters is advisable for cancer at the base of the bladder, large tumors, multiple tumors, recurrent tumors, and, in particular, for those patients whose general health is good and those whose urograms show favorable function of the upper urinary tract. These patients must be without pulmonary and lymphatic metastases, however.

On the basis of his own experience and a review of the literature Godard concludes that total cystectomy for vesical cancer can be performed if the ureters are not dilated, but if they are, the ureters can be transplanted into the skin; otherwise, they can be transplanted into the intestine. In J. P. Robert's technique (Paris, 1943), the bladder is opened, the lesion is examined, and, by extraperitoneal approach, the ureters are brought to the skin. The mortality from this procedure was 15 per cent with frequency survivals of 5 to 10 years.

If the patient does not wish to accept this disagreeable infirmity of ureterocutaneous implantation, the other alternative must be ureterointestinal anastomosis.

With improved surgical technique, the gravity of this operation, it is hoped, will be diminished and the operation will not have to be abandoned.

In spite of considerable extension the tumors are frequently surgically removable.

The author then reviews the operative technique of ureterointestinal anastomosis as described by Hinman, Brenizer, Jewett, and Flocks. He concludes that the numerous techniques of anastomosis justify further research and perfection of operative methods in order to lower the number of postoperative infections.

Godard describes his method of total cystectomy and ureterointestinal implantation. The operation is divided into two stages. The first operation consists of a right colostomy with the formation of an artificial anus. Under local anesthesia a right subhepatic colostomy is done. The posterior portions of the cecum are maintained in order to facilitate closure of the cecum at a later date. A glass tube is placed into the colostomy in order to permit lavage of the colon and also to provide an outlet for the fecal stream. This procedure then allows for frequent colonic lavages and diversion of the fecal stream prior to ureterointestinal anastomosis. Godard believes this procedure reduces the infectious complications of the operation.

In about 10 days the second stage of the operation is performed. This consists of ureterointestinal implantation. The technique is much the same as that of Coffey. He uses a metal guide or a mandrin that is fastened to the end of the ureteral catheter to facilitate the passage of the catheter through the mucosa of the bowel. The trocar at the end of the catheter is picked up by inserting a resectoscope into the rectum; then the catheter is pulled through the rectum until the proper adjustment has been made. The catheter is then fastened in a trough, as in the Coffey II technique, while the distal end of the catheter is brought out through the rectum. The same procedure is carried out on the opposite ureter. The total cystectomy is performed according to the usual technique. In the female the author removes en bloc the uterus, top of the vagina, and the bladder. The colostomy is then closed 3 to 4 months later.

In summary, the author concludes that, in spite of the dangers of the operation that cannot be completely overcome by our technique, ureterointestinal anastomosis remains the treatment of choice for cancer of the bladder and vesical exstrophy. He proposes a preliminary operation to deviate the fecal stream which improves the immediate postoperative prognosis and to a certain extent avoids renal infection until cicatrization and sphincterization of the ureters can take place. In the choice between contact radiotherapy and total cystectomy, a great deal of clinical judgment is required; but with the increasing progress of physical therapy (contact therapy, beta therapy, and injectable radioactive substances), it is possible that operative techniques will form only a minor part of treatment of vesical cancer.

CONRAD A. KUEHN, M.D.

BLADDER, URETHRA, AND PENIS

An Attempt at Classification of the Tumors of the Bladder (Ensayo de clasificación de los tumores de vejiga). ARMANDO TRABUCCO. *Rev. argent. urol.*, 1947, 16: 409.

Tumors of the bladder may be divided basically into monoblastomas, or tumors which are thought to originate from one only of the germ layers of the embryo, and polyblastomas. The latter are rare, being made up almost exclusively of the teratomas (benign), or adult tissue polyblastomas, and dysembryomas (malignant), or poorly differentiated tissue polyblastomas.

The monoblastomas are in turn classifiable into epithelial tumors and connective tissue (conjunctival) tumors. Each of these two categories may be again subdivided into homotypical monoblastomas, or tumors whose tissues conserve the anatomical likeness and other kinship to the parent tissue of the bladder from which they originate, and the heterotypical monoblastomas which vary in characteristics from any of the normal bladder tissues.

The homotypical, epithelial monoblastomas are, of course, composed of the various types of pavement-celled and glandular types of epithelioma, both benign and malignant. Here under the pavement-celled tumors are the papillary and infiltrating carcinomas of the bladder, and under the glandular type are the adenomas and adenocarcinomas (mucoid, colloid). The heterotypical epitheliomas include the spinous-celled epithelioma, the chorioepithelioma, the cylindroma, the alantoid or alantoic tissue epithelioma, and the endometrioma, both adenomatous and carcinomatous.

The homotypical, conjunctival monoblastomas are the histiocytic conjunctival monoblastomas, such

as the fibromas and the fibroplastic sarcomas, the muscular tissue conjunctival monoblastomas, such as the leiomyomas and the leiomyosarcomas, the vascular tissue conjunctival monoblastomas (angiomas, hyperplastic angiomas, angiosarcomas, hemorrhagic angiomas of Kaposi, endotheliomas, endothelial sarcomas, lymphomas, lymphosarcomas), and they are tentatively allowed to include the so-called neural (?) tumors (neuromas, gliomas, neurosarcomas).

The remaining tumors of the bladder are finally grouped into the class of heterotypical conjunctival monoblastomas. These are the melanosarcomas, the rhabdomyomas and rhabdomyosarcomas, the osteomas and chondromas, the lipomas and liposarcomas, and the myxomas and myxosarcomas.

The polyblastomas are, of course, an extremely complex class of neoplasms and no attempt is made to subclassify them. JOHN W. BRENNAN, M.D.

The Diagnosis and Therapeutic Indications in Tumors of the Bladder (Diagnostico e indicaciones terapeuticas en los tumores de vejiga). ARMANDO TRABUCCO and CONSTANTE COMOTTO. *Rev. argent. urol.* 1947, 16: 399.

In discussing the clinical symptoms, and cystoscopic and roentgenologic findings of value in determining the type and degree of malignancy, and consequently the methods of therapeutic procedure to be instituted, the authors divide the findings to be evaluated into six general categories. The first is devoted to the palpation of the empty bladder, the second to the type of vesical hemorrhage, the third to the cystoscopic findings in the tumor and the peritumoral zones, the fourth to the curability (or otherwise) of the inflammatory processes when they are present concomitantly with the tumor, the fifth to the roentgenographic images discernible with cystoroentgenography, and the sixth to the general condition of the patient.

Palpation will disclose any inflammatory processes and tumorous infiltrations of the bladder walls. The inflammatory processes are prone to manifest themselves as pericystic adhesions, and, if extensive and tough, suggest malignancy of the tumor process and inoperability. Induration of the bladder wall also suggests a malignant character of the new growth, but pliability and resilience of the wall suggest benignity and curability by endovesical means.

When the hematuria is inconstant, not occurring very frequently and being easily affected by treatment, the tumor is benign; when the bleeding begins suddenly and is capricious and intractable the neoplastic process is apt to be malignant.

When the cystoscope reveals an intracystic growth, be it pedunculated (benign) or sessile (malignant), which is surrounded by a normal appearing, noninflamed, noncongested, mucosa, the entire process is apt to be benign. When the peritumoral reaction is marked it indicates that the growth is extremely malignant and no time can be lost with conservative measures. The entire inside of the bladder can be seen with the cystoscope and a general inflammatory appearance will speak for malignancy. The exact extent of the newgrowth will be revealed by the cystoscope, and its unilocular or multilocular character suggests malignancy.

The frequency of urination during the day and night, which is not influenced by general measures, chemotherapy, or the local treatment of the bladder, as one would expect in simple bacterial inflammation, is a grave sign. The pollakiuria, painful micturition and stranguria may be produced either by the infiltration and irritation of the nerve centers of the bladder wall, or by a general infiltration of the whole or greater part of the wall, which renders the organ inflexible and of small capacity. These symptoms become especially pronounced when the growth invades the region of the bladder neck and trigone.

All roentgenographic procedures should be preceded by a simple roentgen exposure, without contrast medium, to reveal any foreign bodies or calcareous deposits. The filming with contrast methods includes, of course, descending pyelography, which in cases of bladder tumors is invaluable for determining the length of the intramural portion of the ureter and thus the amount of periureteral neoplastic infiltration, as well as the retrograde filling of the vessel through the cystoscope or catheter with contrast medium or gas. The normal bladder wall gives a very thin line on the roentgenogram and any thickening or irregularity of contour indicates both the malignant character and the extent of infiltration of the tumor. Of course, the unilocular or multilocular character can be seen on roentgenoscopy; the pedunculated masses will appear as central shadow defects, accompanied perhaps by a lighter band indicating the peduncle. Roentgenologic examination when used in conjunction with other methods will always help in the determination of the grade of operability and curability of the tumor.

The general condition of the patient is not discussed at length since it is usually good until the cancerous process is far advanced, when metastases or profuse hemorrhages lead to the cachexia typical of cancer, without the prospect of any cure whatever.

JOHN W. BRENNAN, M.D.

The Relation of Transitional Cell Buds, Golgi Apparatus, and Mitochondria to Carcinoma of the Bladder. ALBERT E. BOTHE and DAVID S. CRISTOL. *Am. J. Roentg.*, 1948, 60: 535.

These authors simplify the classification of bladder tumors into pedunculated and nonpedunculated (or flat) types. Tumors of the first type are papillary; tumors of the second type are infiltrating. The small papillary growth, pedunculated and low grade, is best treated by transurethral fulguration followed by periodic cystoscopic re-examination. Up to the present time transurethral fulguration with insertion of one radon seed at the site of the pedicle has not been evaluated; the results of irradiating the recurrent growths from previously fulgurated tumors in this group also remain to be evaluated. In cases in

which multiple papillary growths of relatively low grade are found, extensive fulguration down to the muscle through a cystostomy, followed by radon seed implantation, seems to be the best method of management. Frequent re-examinations of the bladder should be performed. In cases in which flat infiltrating tumors are present, the extent of the infiltration should be determined by means of pneumocystography and bimanual examination of the bladder under anesthesia. The results of segmental and total cystectomy remain to be evaluated.

The authors studied the distribution and arrangement of transitional cells, and a cytological study was made of the Golgi apparatus and mitochondria found in malignant and nonmalignant cells of the bladder mucosa. The submucosal epithelial buds in the transitional cell-covered tissues of the bladder, described by von Brunn in 1893, appear to be susceptible to growth activity. The early changes in bladder tumors which first involve the submucosal epithelial supporting tissue are inflammatory in type. These changes are followed by proliferation of the basal layer which eventually becomes papillary or infiltrating. The anatomical distribution of these cell nests may be closely associated with bladder tumors; the multiplicity of the epithelial buds in the renal pelvis, ureters, and bladder is in accord with, and very suggestive of, the source of subsequently developing tumors, and the latter probably develop from these epithelial cell nests. If this (unproved) hypothesis is true, how may these immature imperfectly differentiated cell nests be rendered inactive or unsusceptible to growth? On the basis of 5 case histories, the authors believe that roentgen therapy may change these epithelial cells so that the tissue is less susceptible to carcinogenic irritation.

In vesical epithelial cells the Golgi apparatus usually lies in the cytoplasm distal to the nucleus (between the nucleus and free surface). In 15 specimens of bladder tumor there was a reversal of the Golgi apparatus; they were present away from the nucleus membrane and were increased in size. In some, the mitochondria showed an increase in number and a decrease in size; in others, the reverse was true.

The authors conclude that if the tissues susceptible to activation by carcinogenic agents are the immature buds, irradiation of the urinary tract postoperatively (areas covered by transitional epithelium) may arrest or prevent the activation of cell buds.

DAVID ROSENBLOOM, M.D.

Our Initiation into the Field of Total Cystectomy (Nuestra iniciación con la cistectomia total). FRANK A. HUGHES. *Rev. argent. urol.*, 1947, 16: 345.

Six patients were cystectomized by the author in Montevideo, Uruguay, during the past year. The operation was attempted for infiltrating malignant tumor located in the neck and trigone of the urinary bladder. Three of the patients died within a short period following the operation—2 from complications ascribable to the operation itself, and 1 from extension of the neoplastic condition. Three are still living; 2 of these after a year and 1 after only a few months following the operation but in excellent general condition. The operation was attempted in each case for the alleviation of suffering and for intractable bleeding. However, the intention in each case was the total removal of the neoplastic mass.

The actual removal of the bladder and prostate gland has proved less troublesome than the preliminary implantation of the ureters into the sigmoid. In the first patient the attempt at ureterosigmoidostomy failed and the implantation of the ureter was made into the skin. A second attempt by the technique of Jewett (*J. Urol.*, Balt., 1939, 49: 34) also failed and resulted in the loss of the patient. In the subsequent cases this method of implantation was abandoned in favor of the classical technique of Coffey I. This technique was carried out extraperitoneally in 3 cases and intraperitoneally in 2. The implantation of the left ureter was carried out through the left paracolic space in 2 instances with failure of drainage of this ureter and loss of the left kidney function in each case. In subsequent patients the implantation of the left ureter was accomplished into the medial aspect of the sigmoid intraperitoneally by passing the ureter through the mesosigmoid. The 1 living patient in whom this technique was used showed no noticeable loss of renal function.

The ultimate fate of these living patients is, of course, problematical; however, the operation is believed to be a logical one since the great suffering and disability of the patient is largely relieved and the cancers of the urinary bladder are, on the whole, slow to generalize. Metastases are very rare as long as the tumor has not penetrated the muscular layer of the organ.

JOHN W. BRENNAN, M.D.

GENITAL ORGANS

Blood Loss in Open Prostatic Surgery. ALBERT E. GOLDSTEIN and SEYMOUR W. RUBIN. *J. Urol.*, Balt., 1948, 60: 743.

The authors have utilized the technique of photoelectric measurement of hemoglobin to determine the blood loss in the operating room in a series of 48 consecutive open prostatectomies. The entire operating room equipment which had contacted blood was washed in a solution of 0.4 per cent ammonium hydroxide of measured amount, the solution thoroughly mixed, the concentration of hemoglobin determined, and this figure corrected for the patient's own preoperative blood hemoglobin concentration, so that the result would be expressed in terms of cubic centimeters of blood lost.

In 16 cases of two-stage suprapubic prostatectomy performed, the smallest blood loss in the first stage was 3 c.c., the largest 102 c.c., and the average 34 c.c. In the second stage, the smallest loss was 19 c.c., the largest 569 c.c., and the average 157 c.c. The combined average was thus 191 c.c.

The smallest amount of blood loss during 5 one-stage suprapubic operations was 137 c.c., the largest 381 c.c., and the average 278 c.c.

Perineal prostatectomy was performed in 27 cases, with radical removal in 4. The smallest blood loss in the conservative group was 128 c.c., the largest 1,307 c.c., and the average 403 c.c. The average loss in the 4 radical cases was 1,131 c.c. The blood loss in 8 cases of retropubic prostatectomy averaged 493 c.c.

The authors present the view that although more blood was lost in the perineal procedures, the patients were less shocked than the patients who lost less blood during suprapubic procedures. The authors believe that the position of the patient, length of time of operation, handling of the tissues, and balance of the body fluids all play a part in the production of shock. JOSEPH E. MAURER, M.D.

Testicular Tumors: Seminoma and Teratoma. ROBERT E. SCULLY and ASA R. PARHAM. *Arch. Path.*, Chic., 1948, 45: 581.

The author's study is based on a review of 37 cases of testicular tumors from the files of the department of pathology of the Peter Bent Brigham Hospital, for the period from 1914 to 1947.

Tumors of the testicle comprise 2 per cent of all cancers in males. They occur at any age, usually between the ages of 20 and 30 years. Approximately one of every 8 of these tumors is located in a cryptorchid testicle. Rarely a testicular tumor is bilateral. A history of trauma had been reported in from 20 to 68 per cent of cases, but most authors have minimized its significance as an etiological factor.

Testicular tumors metastasize primarily by way of the lymphatic channels. These, for the greater part, drain directly into the abdominoaortic nodes, which extend from the bifurcation of the aorta to the level of the renal veins. There is widespread anastomosis between both sides. The abdominoaortic nodes drain into the lumbar tracts, which ascend through the aortic hiatus of the diaphragm to the thoracic duct. There may be one or more channels from the testis that drain directly into the mediastinal nodes. Enlargement of the inguinal nodes indicates invasion of the parietal tunic and the scrotum. Blood stream metastasis likewise is common and occurs most frequently in the lungs, but may be widespread.

Patients with testicular tumors usually excrete measurable quantities of gonadotropins in the urine. Two distinct types have been identified: the first type of gonadotropin is biologically similar to the pituitary gonadotropin and the second type is biologically identical with the chorionic gonadotropin of pregnancy. In a certain number of cases the titer of chorionic gonadotropin is sufficiently high to justify an Aschheim-Zondek or Friedman test of the conventional type, for pregnancy.

In general, the classification of testicular tumors has been based on one of two theories of pathogenesis, neither of which has been supported by convincing evidence. Ewing stated that (1) all the common testicular tumors are forms of teratoma and (2) the histologically uniform neoplasms represent one-sided development of teratoma. Chevassu concluded that this histologically uniform tumor, which he named "seminoma" because of its supposed origin from the seminiferous tubules, is a distinct tumor not arising from a teratoma.

The authors have retained the term "seminoma" because of its universal use for the common histologically uniform monocellular neoplasm. The term "teratoma" is used to designate a tumor arising from a cell which has the capacity to form structures normally derived from the three embryonic germ layers. There are two subtypes: one is characterized by the presence of neoplastic structures representing two or more germ layers; the other (the monodermal variety) is characterized by a type of tumor tissue foreign to the testis, the presence of which is best explained by regarding it as a one-sided neoplasia of a cell with totipotential capacities.

1. Seminoma (embryonal carcinoma)
2. Teratoma (embryoma)
   (a) Histologically cancerous
   (b) Histologically benign (adult teratoma)
3. Interstitial cell tumor
4. Miscellaneous group

The results of the conventional Aschheim-Zondek and Friedman tests are usually negative in cases of seminoma. The seminomas constituted 46 per cent of testicular tumors. Testicular enlargement was the presenting symptom in 12 of 14 cases of seminoma. The incidence of metastases in cases of seminoma is controversial. In the authors' series, 4 of 14 patients had metastases at or within one month after entry to the hospital; in the remaining 10 patients, the tumor metastasized subsequently. Usually involvement of the abdominal or cervical lymph nodes gave the first indication of tumor spread; terminally, widespread blood-borne metastases were common. The histological structure of the metastases in all cases examined was identical to that of the primary tumor.

The striking x-ray sensitivity of seminoma has been noted by numerous authors. Scully and Parham indicated that the good prognosis of seminoma in their cases was in accord with the experience of numerous other investigators.

The typical specimen of histologically cancerous teratoma is a circumscribed, firm mass which has enlarged and replaced all or the greater part of the testicle. Microscopically, the tumor is composed of an intimate mixture of teratomatous and cancerous neoplastic tissue.

Testicular teratoma may arise from (1) totipotent sex cells or their embryonic predecessors undergoing a type of neoplasia akin to parthenogenesis, or (2) intratesticular inclusions of totipotent primitive embryonic cells (blastomeres). The former origin is far more likely in view of the predilection of teratoma for the sex glands and the distinctive features of teratoma in this location as compared with extragenital teratoma.

Histologically, cancerous teratoma is characteristically associated with excretion of large amounts of gonadotropins, the tumor containing appreciable

amounts of trophoblastic neoplastic tissue giving the highest titers. Histologically, cancerous teratomas constituted 43 per cent of tumors in this series.

Numerous authors have observed that these tumors tend to metastasize rapidly and that early blood stream dissemination is frequent. This impression was borne out in the authors' series. The radioresistance of cancerous teratoma has been noted by numerous authors and this was again borne out by the authors' series of cases.

Histologically, benign teratoma may fall into one of three ill-defined subtypes: (1) organized teratoma; (2) unorganized teratoma; (3) simplified teratoma. An organized teratoma is a rare complex tumor in which rudimentary organs are formed and may be so arranged as to resemble a malformed fetus. In the unorganized teratoma neoplastic structures of bidermal or tridermal origin appear in disorderly arrangement in an attempt at organ formation. Simplified teratoma is the monodermal form. Its most common variety is the epidermoid cyst, and less frequently encountered is the dermoid cyst. Often it is found that histologically benign teratomas have metastasized. The secondary deposits may show histologic structure of cancerous teratoma or embryonal adenocarcinoma. Quantitative studies in a small series of cases have revealed little or no increase in excretion of gonadotropins in the urine of patients who have these tumors. The metastases of histologically benign teratoma have been stated to be radioresistant.

In summary, the author states that over 95 per cent of testicular neoplasms fall into two classes: seminoma and teratoma. The seminoma apparently arises from a primordial germ cell. Its histological uniformity is due to the inert characteristic of its cell which appears incapable of differentiation. The tumor usually grows relatively slowly, metastasizes late, and principally by the lymphatic route. It is highly radiosensitive and occasionally radiocurative. The testicular teratoma apparently arises from the totipotent sex cell or from one of the embryonic predecessors of this cell. Histologically, it may run the gamut from a highly undifferentiated embryonal neoplasm to a mature teratoma showing no microscopic evidence of cancer. The tumor characteristically grows rapidly and metastasizes early, commonly by way of the blood stream. It is rarely radiosensitive, and almost never radiocurative. Occasionally seminoma and teratoma grow side by side, and occasionally they may become intimately mixed. The article contains many excellent illustrations of the types of tumor described by the authors.

CONRAD A. KUEHN, M.D.

MISCELLANEOUS

Renal Response to Thermal Stimulus. L. D. ODELL, G. T. ARAGON, and R. C. SMITTER. *Am. J. Obst.*, 1948, 56: 835.

The authors report their findings of renal activity following a 15 minute immersion of one hand or a foot in an ice water bath at a temperature of one degree centigrade. This test was carried out on 33 women—22 with toxemia of pregnancy, 1 woman with a glioma of the spinal cord during pregnancy, 1 with diabetes insipidus during pregnancy, and 9 nonpregnant women.

The results show a decreased flow of urine, an increase in the specific gravity of urine and, in some instances, a change in protein excretion per minute. Variations in systolic and diastolic blood pressure accompany this experience but do not correlate, in the degree of the response, with the protein excretion per minute.

The fetal heart rate does not vary significantly. Maternal pulse and respiratory rates tend to decrease.

Experiments conducted under anesthesia indicate that ice immersion may stimulate the liberation of an antidiuretic hormone. The site of liberation is probably not within the immersed limb or the kidney; it appears to be above the level of the fourth cervical. The phenomenon is not abolished by inhalation anesthesia. The site of liberation may be the posterior pituitary gland.

JOHN R. WOLFF, M.D.

Neuromuscular Dysfunction of the Urinary Tract. JAMES C. KIMBROUGH, DAVID K. WORGAN, and JOHN N. FURST. *J. Urol.*, Balt., 1948, 60: 780.

The authors present 6 cases of neurogenic dysfunction of the urinary tract. All of the patients had atony of the bladder and ureters with hydronephrosis; all patients complained of abdominal symptoms prior to urological investigation; a diminished renal function, varying from moderate to extreme, was observed in all cases. In none of these patients was a sensory or motor impairment found upon general neurological examination, and none demonstrated idiopathic dilatation of the intestine.

The treatment administered by the authors in the cases presented included ureteral meatotomy, transurethral resection of the vesical neck, presacral neurectomy, and renal sympathectomy. Measures to control infection in the urinary tract were instituted.

The need for careful follow-up therapy in all cases of neurogenic dysfunction of the urinary tract is stressed. The opinion is mentioned that hydronephrosis without tortuosity of the ureters is suggestive of neurogenic disease. JOSEPH E. MAURER, M.D.

Urinary Tuberculosis. REED M. NESBIT and A. WAITE BOHNE. *J. Am. M. Ass.*, 1948, 138: 937.

The authors contend that all patients with either unilateral or bilateral renal tuberculosis should receive prolonged sanatorium care and streptomycin therapy.

This contention is supported by the following pertinent facts:

1. A patient in whom ulcerative lesions eventually healed on this regimen is cited in refuting the claim of other authors that only very early renal tuberculosis can be cured with streptomycin.

2. Reference is made to the exhaustive pathologic studies by Medlar who examined serial sections of the kidneys from individuals who died of pulmonary tuberculosis and found that bilateral cortical infections were present in all the kidneys.

3. Combined statistics from the Squier Clinic, New York, the Mayo Clinic, Rochester, Minnesota, and the University Hospital, Ann Arbor, Michigan, reveal that only about half of the patients can be cured by nephrectomy, even when the operation is done under ideal circumstances.

The use of very small doses of streptomycin for short periods with the hope of avoiding toxicity is condemned. Although optimal dosage and duration remain uncertain, the authors recommend 2.0 gm. of streptomycin daily for 60 days. At the end of this time, complete studies of the urine and retrograde pyelograms should be made. If these show evidence of healing, the treatment should be continued for an additional 60 days. If the 60 day survey reveals no improvement, nephrectomy is justified but should be followed by 60 days of streptomycin therapy. All patients should have a minimum of 6 months of sanatorium care. ORMOND S. CULP, M.D.

Tumor and Superimposed Cyst of the Urachus (Tumor y quiste supurado del uraco). JOSÉ S. DOTTA. *Rev. argent. urol.*, 1948, 17: 174.

The case reported by the author was that of a 59 year old male who complained of a indurated area in the midabdominal line from the umbilicus to the symphysis pubis. There was dense subcutaneous fat underlining the region which was very tender and which made palpation difficult. Cystoscopy revealed an infiltrating tumor in the dome of the bladder. This suggested the diagnosis of urachal cyst superimposed upon a vesical tumor.

Operation was performed and both masses were removed *in toto*, including resection of the umbilicus and the dome of the bladder. Convalescence was uneventful and was followed by deep roentgentherapy. The tumor was of an intramural type and has shown no evidence of recurrence either in the abdominal portion or in the bladder.

STEPHEN A. ZIEMAN, M.D.

Cancer of the Urachus (Cancer del uraco). RICARDO ERCOLE. *Rev. argent. urol.*, 1948, 17: 193.

Cancer of the urachus is a rare disorder. There are apparently only 164 cases of this condition on record. It is a disease of adult life and usually involves the dome of the bladder. For this reason therapy involves bladder surgery.

The case reported is that of a 64 year old male who complained of pain in the hypogastrium, burning on urination, and polyuria. Only on cystoscopic examination was the presence of a tumor observed. This was a sessile, ulcerated fungoid mass in the dome of the bladder, a section of which was removed for biopsy. The pathologic report returned gave a diagnosis of cylindrical papillary epithelioma with origin in the epithelial rests of the urachus.

The author calls attention to the fact that tumors in the upper regions of the bladder may well be of urachal origin and must be differentiated from primitive adenocarcinoma of the bladder. The latter, it is stated, arise from the bladder mucosa and secondarily invade the muscle layer, whereas urachal tumors invade the muscular layer primarily and the mucosa only secondarily. Treatment consists in resection of the tumor, which may include the dome of the bladder or even complete cystectomy and removal of all umbilical tissue if the extension of the growth demands it. STEPHEN A. ZIEMAN, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Legg-Perthes' Disease: A Syndrome of Many Etiologies? S. Z. Draznin and Karl Singer. *Am. J. Roentg.*, 1948, 60: 490.

This disease was first described by Legg and independently by Waldenstrom in 1909, and in 1910 by Calve and Perthes. The latter gave a more clear-cut description of the clinical picture and the roentgenographic findings. Among the names given to the disease are osteochondritis deformans juvenilis, pseudocoxalgia, quiet disease of the hip, osteochondrosis, and coxa plana. Gill has expressed the belief that the primary location of the disease is in the metaphysis of the neck rather than in the capital epiphysis.

Among the etiological theories advanced are the following: traumatic, infectious, congenital stigmata; unrecognized congenital dislocation; rickets; rheumatic, endocrine, embolic, vascular, familial osteochondritis, similar to Koehler's disease; and alterations in the calcium-phosphorus metabolism. Gill states that it is doubtful that all types of osteochondritis deformans juvenilis are manifestations of the same pathologic process. The condition is often mistaken for acute osteomyelitis or tuberculosis of the hip joint.

The authors have added Gaucher's disease to the list of etiologic factors. They present a case of proved Gaucher's disease which had been followed up for 18 years. The patient presented the roentgenographic features of Legg-Perthes' disease.

Daniel H. Levinthal, M.D.

Diffuse Inflammation of Cartilage. A Case Report of a Hitherto Unreported Entity. Everett J. Gordon, Aaron W. Perlman, and Nathan Shechter. *J. Bone Surg.*, 1948, 30-A: 944.

This comprehensive report of a case of diffuse inflammation of cartilage observed over a period of 3 years is considered most unusual in that no diagnosis has been made in spite of extensive pathologic studies.

A 34 year old negress first complained of a productive cough and dyspnea. Roentgenograms of the chest showed no evidence of tuberculosis. After several months, swelling and tenderness of the knee and ankles was observed, with remissions and exacerbations, sometimes febrile. Swelling of an eye and both ears, and increasing cough and hoarseness ensued. Hospitalization failed to yield a definite diagnosis, although exhaustive studies were carried out. Fluid aspirated from the involved knee joint did not yield organisms, and sulfamerazine therapy did not influence the clinical picture. Tracheotomy was necessary in patients with severe obstruction due to chondritis of the tracheal rings.

A 2-plus Kahn test led to antisyphilitic therapy of potassium iodide and bismuth in oil. A total of 1,320,000 units of penicillin was administered. On x-ray examination the left knee and both ankle joint spaces showed narrowing. Episodes of iritis and conjunctivitis recurred repeatedly. There was persistent tender swelling of both ears and of the bridge of the nose. Remissions and exacerbations continued in the various affected areas.

Because of extreme pain from the slight motion residual in the left knee, arthrodesis was undertaken, following which the patient failed to respond. Autopsy was not secured.

Careful studies of cartilage taken from the various sites affected have been made by several pathologists. Nothing more conclusive than "diffuse chondritis and perichondritis" has been determined.

Frances E. Brennecke, M.D.

Tenosynovitis of the Extensor Carpi Ulnaris Tendon Sheath. Douglas D. Dickson and Clarence A. Luckey. *J. Bone Surg.*, 1948, 30-A: 903.

Nonsuppurative tenosynovitis of various tendon sheaths of the hand, frequently the extensor pollicis brevis or abductor pollicis longus, is described. Tenosynovitis of the extensor carpi ulnaris tendon sheath is here presented as a clinical entity proved by surgery in 6 cases.

The history usually dates from a twisting injury to the wrist, followed by pain deep in the wrist joint, which may be aggravated by all wrist motions. There may be swelling about the distal ulna and sensory disturbance along the dorsal cutaneous branch of the ulnar nerve. Examination shows tenderness along the tendon and may elicit grating in the sheath with motion. Resisted motion defines the pain more readily.

Pain which persisted or remained in spite of varying periods of wrist immobilization led to surgical exploration of the 6 cases presented. Edema of the subcutaneous tissues surrounding the dorsal branch of the ulnar nerve was a constant finding. The dorsal carpal ligament was sectioned to show the extensor carpi ulnaris tendon sheath within which the synovia was thickened, and many new vessels were present. The tenosynovitis was most marked in the snug portions of the sheath, i.e., the channel on the ulna, and at the insertion.

Probably hemorrhage within the tendon sheath produces the nonspecific inflammatory reaction in the synovia.

The diagnosis of tenosynovitis should be suspected when the patient complains of pain deep in the wrist. Opening of the fibrous tunnel throughout its length would probably relieve the symptoms, although in these cases the thickened synovia and granulations were removed in addition.

Frances E. Brennecke, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

The Treatment of Compound Injuries of the Knee Joint (Zur Behandlung offener Kniegelenksverletzungen). JOHANNES VOLKMANN. *Chirurg*, 1948, 19: 343.

In cases of compound injuries of the knee joint in which x-ray facilities are unavailable the joint is left open. The knee is splinted, aspirated, and irrigated with a sulfonamide compound. The joint may stay open up to 36 hours without any harmful effects.

As soon as a well equipped operating room is available a tourniquet is applied to the leg under general anesthesia and an incision is made similar to the one used in meniscectomy. The wound is débrided with 1 to 1,000 ravinol. The synovia is closed tightly with catgut and the capusle is united with cotton sutures. The skin may be left open or is loosely sutured. No drain is used. A long leg cast is then applied. Sulfanilamide is given by mouth. Mobilization of the leg is begun as soon as the condition improves. First the foot is left free and then the hip, and finally the cast is removed entirely.

In cases in which conservative treatment fails, 4 wide incisions are made over the knee joint. Once the infection has subsided, closure of the wound is attempted. GEORGE I. REISS, M.D.

FRACTURES AND DISLOCATIONS

Intracapsular Fractures of the Neck of the Femur. Follow-Up Report of 130 Patients Treated by Internal Fixation with the Smith-Petersen Nail. CHARLES S. NEER and HARRISON L. MCLAUGHLIN. *Am. J. Surg.*, 1948, 76: 528.

The authors review 130 consecutive intracapsular hip fractures treated on the Fracture Service of the Presbyterian Hospital, New York, between 1932 and 1944. True intracapsular lesions occurred in approximately 50 per cent of all hip fractures. A Smith-Petersen nail was used in each case. Fractures of more than 2 weeks' duration were excluded.

Every hip fracture was considered an acute emergency. Operation was usually performed within 1 or 2 hours, and in 80 per cent of the cases within 6 hours of admission. Impacted valgus lesions were nailed without reduction or visualization of the fracture. All displaced fractures were reduced prior to fixation. In 73 cases this was done under direct vision and in 31 cases under roentgenographic control. Subcapital oblique fractures proved to be the most difficult to reduce and frequently could not be reduced adequately by manipulation alone. The authors have developed a policy of modifying the lesion so that the line of fracture approaches the horizontal plane. Following operation, 65 per cent of all the patients were allowed out of bed within 24 hours. Those physically able to use crutches began to walk without weight-bearing in a walker about the fourth postoperative day and were promoted to crutches as rapidly as they could tolerate them.

The authors believe that the morbidity constantly diminished in direct proportion to the speed and efficiency with which stabilization of the fracture was carried out. The mortality was divided into three categories: (1) operative mortality, including deaths from any cause during the first 30 days following operation (there were 2 deaths in this group, 1 from a pulmonary embolism 28 days after operation, and 1 from cardiac failure 4 days after operation); (2) mortality related to injury, including deaths related to the injury occurring within 9 months of operation, (there were 2 deaths in this group, 1 at 4 months, from pulmonary embolism, and 1 at 7 months, due to infection of the hip and pneumonia; (3) mortality unrelated to injury, including all deaths from unrelated causes between the end of the first month and the ninth month (there were 8 in this group: 3 cardiac infarctions, 2 cerebral accidents, 1 malignancy, 1 renal failure, and 1 suicide).

There were 26 cases of impacted valgus fractures. There were no deaths or wound infections in this group. The average hospital stay was 14 days, and the average weight-bearing time 5 months. Twenty-three cases (92%) were followed up adequately, and among these there were no nonunions, 3 cases of mild necrosis, and 1 case of severe necrosis. "Mild" necrosis indicates avascular changes affecting only the roentgen texture of the femoral head. "Severe" necrosis indicates changes pronounced enough to change the shape or contour of the femoral head. The term "arthritic change" tends to confuse the issue and is omitted.

There were 104 cases of displaced fractures. The operative mortality was 1.3 per cent in 73 cases treated by open reduction and 3.2 per cent in 31 cases treated by closed reduction and lateral nailing. Closed reduction and lateral nailing constantly required more time than open reduction and nailing under direct vision. It was also a constant observation that (1) regardless of the characteristics of the fracture, reduction and fixation were accomplished more certainly and accurately when carried out under direct vision; and (2) this unselected group of patients withstood the effects of open reduction as well as, if not better than, manipulative reduction and blind nailing.

The early complications of 73 displaced fractures treated by operation were: poor reduction (15%), serious infection (1 case), trivial infection (8%), and loss of fixation (15%). The early complications of 31 cases treated by closed reduction and lateral nailing were: poor reduction (45%), trivial infection (10%), and loss of fixation (7%).

There were 21 cases of nonunion in 104 displaced fractures (72% of all the nonunions were in the subcapital fractures). Among 73 displaced fractures treated by open reduction, there were 16 cases of nonunion. Eleven were attributed to poor reduction, 2 to poor fixation, 2 to too early ambulation with weight-bearing, and 1 case to failure of the local circulation. Among 31 displaced fractures treated by closed reduction and lateral nailing, there were 5

cases of nonunion. Four were considered to be due to poor reduction and 1 was due to poor fixation.

In determining the number of cases of avascular necrosis, 18 months were considered to be the minimum adequate follow-up period. Thus, only 74 of the 104 displaced fractures were considered. Forty-two per cent of the healed fractures treated by open reduction and 54 per cent of those treated by closed reduction and lateral nailing subsequently developed aseptic necrosis. Eleven months was the average interval between operation and demonstrable early avascular changes. In spite of the much higher proportion of subcapital fractures in the open reduction group, the incidence of aseptic necrosis remained consistently less than in the simpler cases treated by closed reduction. This finding contradicts the widespread impression that open reduction contributes to avascular necrosis.

In 18 cases observed between 1933 and 1937 a flap of rectus femoris or vastus lateralis muscle was inserted into a decorticated area on the anterior surface of the head and neck of the femur in the hope that it would increase the local blood supply to the head fragment. The results of analysis of 13 suitable cases warrant little optimism that the procedure was of any help in preventing aseptic necrosis or of any aid in the healing of the fracture.

The authors consider these results discouraging and humbling. Almost every poor surgical result was found to be due to some controllable defect in the technique of therapy. Although the patient was satisfied in 86 per cent of the cases treated by open reduction and 92 per cent of those treated by closed reduction and lateral nailing, the surgeon was satisfied in only 25 per cent of the former and 20 per cent of the latter.

The authors arrive at the following conclusions:

1. The best time for reduction and fixation of a hip fracture is immediately after the fracture.
2. Good treatment for impacted valgus fractures of the femoral neck is internal fixation and as little confinement to the bed as possible.
3. Open reduction, properly done, is surer, less time consuming, and no more dangerous than closed reduction and blind nailing.
4. Open reduction does not increase the incidence of subsequent aseptic necrosis.
5. Results are known only after objective evaluation.
6. Almost all the bad results of hip nailing are still the results of bad hip nailing.

JOHN J. CRANLEY, JR., M.D.

General Conceptions of Pseudarthrosis. Statistical Considerations. (Concepto general de seudoartrosis. Consideraciones estadísticas). OSCAR R. MARÓTTOLI. *An. Cirug.*, Rosario, 1948, 13: 23.

During the period from 1943 to 1946, at the public hospital in Rosario, where the injured are brought directly for immediate treatment, 7,654 fractures were supervised continuously during the entire period of healing. Only 0.1 per cent of this number presented pseudarthrosis. In the author's private practice, on the other hand, the pseudarthroses were much more numerous. They occurred mostly in patients who had been originally treated on other services. In the author's material the fractures most prone to develop pseudarthrosis were those of the neck of the femur and of the carpal scaphoid bone.

True pseudarthroses may be roughly classified into (1) those which do not consolidate because of the absorptive processes in the ends of the bony fragments (the author ascribes these to the excessive congestion and dilatation of the blood vascular system and states that these pseudarthroses will heal without further trouble, as a rule, when properly immobilized), and (2) the fractures which fail to consolidate because of poor blood supply. These pseudarthroses will not heal, as a rule, because of the eburnation and occlusion of the marrow cavity of the fragments, and the line of fracture and the bone ends will have to be removed surgically.

The author concludes, from his own experience and from a study of the literature, that the fractures most resistant to the processes of consolidation are those which are most difficult to immobilize properly, and that the development of the pseudarthrosis is largely a result of improper treatment methods. Certainly there is nothing about fractures of the neck of the femur and of the carpal scaphoid bone which suggests that they would not heal as readily as other fractures if they could be sufficiently retained during the period of consolidation.

JOHN W. BRENNAN, M.D.

The Experiences and Results of Various Operations for Habitual Dislocation of the Shoulder (Erfahrungen und Erfolge bei den verschiedenen Operationsmethoden der habituellen Schulterluxation). OSWALD ADAM. *Chirurg*, 1948, 19: 368.

This article is based on 23 operations. Ten shoulders were operated on according to the Eden-Hybenette method, which consists of an insertion of a tibial graft anterior to the humeral head. Nine shoulders were operated on according to the Loeffler-Joseph method (modified Nicola) and 3 according to the technique described by Heymanovitsch which is very similar to the Nicola operation. There was only 1 case in which only the capsule was tightened. The author concluded that the Eden-Hybenette method of repair gives the best results.

GEORGE I. REISS, M.D.

ORTHOPEDICS IN GENERAL

Estrogens and Bone Formation in the Human Female. MARY S. SHERMAN. *J. Bone Surg.*, 1948, 30-A: 915.

A review of the literature on the relation between blood calcium levels and ovulation in birds and small mammals introduces an interesting case study. Interrelation of estrogens and bone growth in human females is known to exist but its mechanism is not understood. Postmenopausal osteoporosis has been

established clinically by Albright as a hormonal deficiency influenced by the injection of estrogens, without demonstrable increase in bone density. A spectacular variation in bone density during the administration of estrogens is demonstrated.

The woman was perfectly well until the age of 54, when the right tibia began to bow. Soon thereafter, while jumping rope (!), the left knee was injured. Roentgenograms were interpreted as showing Paget's disease but no fracture. Later in the same year the patient suffered a fracture of the lower right femur with moderate trauma, and she became bedridden because of the fracture and increasing bone pain. Deafness began to develop. Subsequent roentgenograms showed changes in the skull, pelvis, femurs, right tibia, and right humerus. The condition was diagnosed as parathyroidism and two parathyroid glands were removed, but the patient's condition continued unchanged.

During the next 2 years she was bedridden with agonizing bone pain, multiple fractures, cramps, and muscle twitching. At the age of 58 years she was admitted to the University of Chicago Clinics. Anesthesia was needed to control pain so that roentgenograms could be taken. Clinically, the right leg seemed boneless, and roentgenograms scarcely demonstrated the tibia, while the extremely osteoporotic femur presented multiple fractures.

Extensive studies, particularly on calcium excretion, were carried out and a biopsy of affected bones was secured. Beyond a marked decrease of bone substance, these specimens were not remarkable. On the basis of the data assembled, i.e., normal blood calcium and phosphorus, low urine calcium, and a normal histological picture, a diagnosis of Paget's disease with superimposed postmenopausal osteoporosis was entertained. (The patient had a surgical menopause 17 years earlier.)

Massive doses of estrogenic hormone gave a rapid change of clinical picture in 3 days, and after a month the patient sat in a chair for meals. Roentgenograms at one month showed well defined bones in the right leg with abundant callus healing of the fractures in the femur. Biopsy specimens affirmed this reconstitution of bone. Withdrawal of estrogen therapy promptly produced an exacerbation of symptoms which receded on resuming the estrogen therapy. A maintenance dose was worked out, and the patient has been kept on that for a period of 2 years, with no untoward symptoms.

FRANCES E. BRENNECKE, M.D.

A Study of the Longitudinal Arch of the Foot. A. K. BASU. *Ind. J. Surg.*, 1948, 10: 255.

The influence of postural tone on the longitudinal arch of the foot is not clear. Postural tone is a state of continuous contraction of certain skeletal muscles which maintain the position of posture. This tonus is a system of reflexes, whose afferent impulses originate in the sense organs of a group of muscles, aided by the eyes and vestibular apparatus. Exact anatomic localization of the center is equivocal, but it may be found in the red nucleus and in the rubrospinal tract.

Collapse of a longitudinal arch is predicated upon the superimposed dead weight and/or long periods of standing on the foot. Nurses, policemen, and waitresses rate highest in pes planus. In contradistinction, people who walk for long distances, with or without shoes and enjoy rest between long hikes develop less static disturbances of his feet. Hence, the hypothesis of muscle indefatigability in the maintenance of a suitable arch is not tenable.

The author undertook to study the behavior of the longitudinal arch under (1) spinal anesthesia, (2) complete paralysis of the lower extremities, (3) extensive inflammatory conditions about leg and foot, (4) acute toxemic conditions, (5) late stages of pregnancy, and (6) footprints obtained from recently amputated legs.

Spinal anesthesia studies were carried out on 15 patients who underwent various surgical operations under spinal anesthesia and revealed negligible longitudinal arch changes.

Twenty cases of paralysis of the lower extremities were studied. The paralysis, for the most part, was due to trauma. In 2 cases it was due to transverse syphilitic myelitis and cerebral thrombosis, respectively. According to the postural theory, abolition or relative diminution of the arch would be envisaged, but the observation failed to show any appreciable change in the integrity of the arch.

Nineteen cases of acute inflammatory lesions of the leg and foot were included in this series. The inflammations were ascribable to cellulitis, osteomyelitis, and compound infected fractures of the foot. Again, according to the postural theory, i.e., inhibition of the postural tone of the inflamed muscles, falling of the arches was not evident. When the inflammatory agency included the ligamentous capsular apparatus, however, the arch did collapse rapidly.

Twenty-eight cases of an acute toxemic condition were observed; the patients were suffering from pneumonia and enteric fever. It is alleged that the tone of the musculature, under toxemic states, was markedly reduced. In none of these patients, nor in others chronically ill with emaciating diseases, did collapse of the longitudinal arches ensue.

The footprints of 30 pregnant women were studied either before or after delivery. Since flaccidity and generalized ligamentous relaxation is emblematical of pregnancy, it may be expected that pes planus is a concomitant of pregnancy. The average arch fraction was 45.

Seventy-two pounds of pressure were exerted on each of 19 feet on recently amputated legs. If the arch was solely maintained by the postural tone of the muscle, lowering of the arch would be expected. This did not occur.

Several feet were prepared and comparable weights (36–72 lbs.) were arranged to exert perpendicular pressure on the longitudinal arch to determine the influence of ligamentous support on the

arch of the foot. One foot had all of its ligaments intact, whereas, its fellow had its ligaments cut. In the latter, the same weight caused collapse of the arch, and in the former the arch maintained its relative position.

Stages in the development of the arch of the foot after birth were studied. About 200 extremities of babies from birth to the age of 10 years were observed. Immediately after birth, and up to the age of 5 months, the arch was not demonstrable. The toes were divergent, the heel was small, flexion creases were prominent, and the foot assumed a triangular characteristic similar to prints obtained in a matured monkey. It was not until after 18 months that the arch made its appearance. Between the ages of 2 and 3 years, the rudimentary arch was found in 56 of the 60 prints examined. The adult form of the arch was discernible at between the ages of 4 and 5 years. It could be noted that until this time the foot of an infant was pliable and inverted, and contained copious deposits of fat. After this period the arch assumed rigidity and the foot exhibited characteristics of maturity.

The author examined about 200 fetuses. The smallest measured 8.5 mm. in length and the largest had reached full term. No discernible differentiation of the hands and feet could be made until the fetus reached the age of 6 weeks. At this time digits appeared in both the hands and feet. The digits were radially divergent with abduction of the hallux and the pollex. At the eighth week or in the 28 mm. fetus, the heel had appeared and the foot assumed an angle with the axis of the leg.

The dissection of the feet of many fetuses disclosed the longitudinal arch to be fairly complete when the heel appeared fully developed (in 8 weeks). Although some of the tarsal bones were still in the cartilaginous state the skeletal components of the arch had achieved a well defined outline. Other pertinent ontogenetic data were the average length of the tarsal bones in an embryo of 20 mm.: (1) the average length of the heel was 21 per cent of the length of the foot, (2) that of the tarsus was 44 per cent of the length of the foot, (3) that of the metatarsus, 26 per cent, (4) and that of the phalanx, 16 per cent of the length of the foot.

Since the author has confined his exhaustive studies to barefooted patients, he has arrived at the conclusion that, on the whole, the arches of the barefooted do not differ from those of persons who wear shoes. The arches of the latter may be lower with slight abduction of the forefoot. Evidence has been presented that the real factors in the maintenance of the arch are the bony configuration on the medial aspect of foot and the strong ligaments.

Examination of the feet of primate animals have shown the stigmata of Wolff's law. With the changing of the mode of living, manner of locomotion, and discard of arboreal existence, the shape of the feet of these animals is constantly approximating that of man. In the case of the gorilla in upright position the similarity is still closer to man, whose terrestrial habitation has governed the present configuration of his heel, the longitudinal arch, the large tarsal bones, and the relatively small forefeet.

SAMUEL L. GOVERNALE, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

On the Treatment of Varicose Veins by Ligation of the Saphenous Vein and Injection in Both Central and Peripheral Directions According to Ollonqvist's Method. V. TUOMIKOSKI. *Ann. chir. gyn. fenn.*, 1948, 37: 207.

The author analyzes the treatment of varicose saphenous veins, in 340 patients, by the method of Ollonqvist. The technique consists of isolating the greater saphenous vein in the upper part of the thigh —the site being that at which an impulse is detected when the distended vein is tapped in the leg or lower thigh—and slowly injecting 2 c.c. of 20 per cent sodium chloride solution proximally, then 5 to 10 c.c. of the same solution quickly, distally. The vein is ligated after each injection, and then divided.

The immediate results of treatment were good. In 57 per cent of cases occlusion of the veins occurred after a single injection, and in 43 per cent of cases postoperative injections were necessary. Undesirable effects were: (1) pain which occurred locally, and with a peripheral radiation in most cases; (2) periphlebitis in 2.6 per cent of cases; (3) wound infection in 0.4 per cent; (4) postoperative hemorrhage from the central stump in one case; (5) necrosis of the skin from leakage of the sclerosing solution from the vein in rare instances; (6) brown pigmentation along the course of the injected vein in many cases. No cases of pulmonary embolism occurred.

In a follow-up of 133 patients who had undergone treatment from 2 to 9 years previously (a total of 210 ligations), evidence of recurrence was observed in 120 (57%); the remaining patients were free of recurrence. Seventy-five per cent of patients with recurrences had recanalization of all or most of the saphenous vein, and the chief cause of recanalization and recurrences is to be found in insufficiency of the deep communicating veins.

The author believes that the great advantage of the sclerosing method of treatment is the freedom from embolic complications. In a collected group of 1,471 operations, only one doubtful case was observed. EDWARD H. CAMP, M.D.

The Etiology of Leg Ulcers and Their Treatment by Resection of the Popliteal Vein. GUNNAR BAUER. *J. internat. chir.*, Brux., 1948, 8: 937.

The author believes that a previous thrombosis is the commonest cause of the lower leg syndrome. This syndrome is characterized by chronic edema of the lower leg, pain of a dull bursting character, skin lesions in the form of constricting bronze-colored induration, and typical ulcers.

In an effort to discover the causative factors of these ulcers in patients who have not previously had a thrombosis, careful studies were made of 100 patients with varicose veins or leg ulcers. Retrograde injections of the femoral or great saphenous veins were made with the use of 20 c.c. of radiopaque media, and roentgenographic studies were carried out. These roentgenograms presented two characteristic pictures. Group 1 comprises 45 cases demonstrating a normal femoral vein with competent valves. Group 2 comprises 55 cases showing the entire femoral and popliteal veins, the deep veins of the leg and, at times, the subcutaneous varicosities to be filled with the contrast material. The author considers this to be a demonstration of a pathological femoral and popliteal vein, with incompetent valves, affording the opportunity for a retrograde flow of blood. In the latter group were found principally the cases with the leg syndrome. The varicosities in group 1 were rarely symptomatic and usually required only high resection of the great saphenous vein, preferably combined with the retrograde injection of a sclerosing solution.

To further study the pathological physiology in deep venous insufficiency, determinations of the pressure in the popliteal vein were made. It was found that in all the veins of the lower extremity a hydrostatic pressure exists that at any given point is roughly equal to, or just below, the weight of a column of water extending vertically from the point of measuring to the level of the heart. When the vein is obstructed distal to the site of measurement there is a greater rise in the cases of proved valvular insufficiency of the femoral vein. It is believed that the orthostatic venous overloading is the cause of the bursting pain almost always complained of by these patients, and that this condition probably leads to the edema.

Evidence based on phlebographic studies is presented to show that a frequent cause of the lower leg syndrome is thrombosis, and 25 such cases are reviewed. Thirteen of these showed evidence of recanalization, which, in turn, implies that the vein valves have been permanently destroyed. The remainder have large satellite femoral veins which bypass the thrombotic areas and produce, in effect, a similar situation.

Thirty cases were observed in which the femoral insufficiency was not caused by thrombosis. These presented a different picture. Microscopically there is a low degree of phlebosclerosis. There is probably a resultant loss of elasticity of the vein wall and valvular incompetence. A marked hereditary influence was found. The author believes that since exact knowledge is lacking, this group should be called idiopathic.

Interruption of the popliteal vein by means of ligation and segmental resection is advocated as the logical treatment, in preference to the higher ligation recommended by Linton and Hardy. The objection to high ligation is that the femoral vein below this level is often filled up with blood from

muscle veins or incompetent satellite veins, and the back pressure on the lower leg is maintained. Fifty-four such operations have been performed at the Mariestad Hospital, in Sweden. The immediate results were good. Twenty-four patients were followed up after a period of 3 to 14 months and the bursting pain had disappeared in all; edema remained in 4, induration in 10, and ulceration in 2.

LEROY J. KLEINSASSER, M.D.

Management of Venous Thrombosis and Pulmonary Embolism Following Injury to the Extremities. FRED B. AURIN and LOUIS G. HERRMANN. *Am. J. Surg.*, 1948, 76: 586.

The general incidence of venous thrombosis in patients who have sustained injury to the legs is almost 12 per cent as compared with 2 per cent of hospitalized surgical patients in the Midwest. Such clots usually occur in the large veins of the traumatized extremity, or in the pelvic veins in cases of pelvic fractures.

Regular and frequent examination of the thigh, calf muscles, and feet of all patients is essential in the diagnosis of initial phases of venous thrombosis. Promoting venous return from the legs and pelvis is an excellent method of prophylaxis against thrombosis and embolism; thus, good heart action, activity of the muscles of the extremity to pump blood along the vessels, and the gravitational effect of slight elevation of the foot of the bed are important features in the prevention of this complication.

Once thrombosis has been established, treatment must be designed to limit extension, prevent embolism, and correct local impairment of venous circulation in the affected extremity. The author uses heparin and dicumarol as the primary measure, followed by ambulation when local signs have subsided. Such anticoagulant therapy is maintained for 10 to 14 days unless the patient is confined to bed because of the primary disease, in which case dicumarol is administered to maintain a prothrombin concentration of from 30 to 50 per cent of normal.

EDWARD H. CAMP, M.D.

The Value of Transmetatarsal Amputations in the Management of Gangrene of the Toes. WESLEY FURSTE and LOUIS G. HERRMANN. *Arch. Surg.*, 1948, 57: 497.

Since 1934 transmetatarsal amputation has been performed for gangrene in 91 cases with a follow-up in 85. The patients with cellulitis in addition to gangrene were first treated with penicillin until the infection subsided. Inhalation anesthesia was most often used. All the amputation wounds were left open except 1 in which a partial closure was done. However, more tissue was left on the plantar surface than on the dorsum of the foot in order that the final closure would provide a long plantar flap. Secondary procedures such as the application of a free graft to the granulating stump were frequent. In the cases in which good healing was obtained the patients had little difficulty in standing or walking on the shortened foot. There was no phantom limb pain.

TABLE I.—RESULTS WITH TRANSMETATARSAL AMPUTATIONS

Disease	Results for amputations with adequate follow up						Number of amputations without adequate follow up
	Excellent	Good	Fair	Poor	Questionable evaluation	Total	
Gangrene; diabetes	9	6	4	21	1*	41	1
Gangrene; arteriosclerosis	7	1	1	12	5†	26	3
Gangrene; frostbite	8	3	0	1	0	12	1
Gangrene; osteomyelitis	1	0	1	0	0	2	1
Gangrene; arterial embolism	1	0	0	0	0	1	0
Indolent ulcer, neurotrophic	0	0	1	1	0	2	0
Gangrene; thromboangiitis obliterans	0	0	0	1	0	1	0
Total	..	..	..	..	..	85	6

*The 57 year old diabetic white woman considered to have a questionable result died 8 days postoperatively of a myocardial infarct demonstrated at autopsy.

†The patients with arteriosclerosis considered to have questionable results were as follows:

1. A 74 year old white man with an ulcer of his stump who died 7 months after the transmetatarsal amputation because of probable carcinoma of the stomach.
2. A 58 year old white man who died 1 month after operation without definite determination of the cause of death.
3. A 58 year old Negro with a well healed stump for 6.25 months postoperatively who suffered frostbite and required a low leg amputation.
4. A 68 year old white man who died 1 month postoperatively with bronchopneumonia.
5. A 67 year old white man who died 2 weeks postoperatively with pneumonia.

The results were best when the gangrene was due to frostbite. On the other hand, in the presence of intrinsic arterial disease (thromboangiitis, diabetes, and arteriosclerosis) only 36 per cent of the results were classified as good or excellent. The details of the follow up are given in Table I, above.

The hospital mortality in the diabetic and arteriosclerotic group was 14 per cent, which is lower than the 22.7 per cent for major amputations in diabetes at the same institution, and 23.9 per cent in arteriosclerosis obliterans without diabetes.

The authors conclude that the operation is safe and is rarely associated with phantom limb pain, but there must be a judicious selection of cases, the operation must be carefully performed, and preoperative and postoperative care must be adequate.

THEODORE B. MASSELL, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE, POSTOPERATIVE TREATMENT

Parenteral Use of Water, Dextrose, Electrolytes, Fat, and Vitamins. WALTER G. MADDOCK. *Arch. Surg.*, 1948, 57: 553.

This article is a consideration of the therapeutic needs of persons unable or not permitted to take sufficient fluids or food by mouth. In the majority of cases treatment can be kept relatively simple. The use of chemical studies and laboratory data is important and their interpretation is discussed. The body's daily water requirement is discussed particularly in view of its importance to renal function, and the importance of the specific gravity of urine is emphasized and explained.

The use of dextrose solutions for intravenous use should be used specifically for the introduction of water and carbohydrates, but they have no specific value in shock or for replacing electrolyte loss. Protein hydrolysate solutions are indicated in the presence of undernutrition. Five grams of salt given parenterally should be enough for maintenance unless there is evidence of abnormal loss. Probably during the immediate postoperative period (2 days) sodium chloride should not be given.

Dehydration presents a special problem, and deficits should be studied and properly replaced.

Dehydrated patients are usually studied to determine:

1. The combining power of plasma carbon dioxide. This test should be augmented by a clinical distinction between "metabolic" and "respiratory" disturbances. If the alteration is the result (partially or totally) of a respiratory disturbance the plasma *p*H should be determined.
2. Serum sodium.
3. Serum potassium.
4. Plasma chlorides.
5. Blood nonprotein nitrogen.
6. Plasma proteins.

The symptoms and signs of dehydration are more acute as the deficit develops more rapidly. The manner in which dehydration develops may alter the picture; the dehydration may be due primarily to water loss or to electrolyte loss.

Specific case examples of types of loss and water and electrolyte needs are discussed, including (1) vomiting from pyloric obstruction, (2) vomiting from duodenal, jejunal, or upper ileal obstruction, (3) bile or pancreatic fistula drainage, (4) ileostomy drainage and diarrhea, (5) ketosis of diabetic and nondiabetic origin, (6) nephritis, and (7) burns.

To develop "working approximates" for parenteral therapy a consideration of the history, physical examination, and laboratory studies including the volume and the specific gravity of urine, the hemoglobin and hematocrit values, plasma chloride, protein, carbon dioxide combining power, and blood nonprotein nitrogen may be needed.

The common and special solutions for parenteral use discussed are (1) isotonic sodium chloride, (2) Ringer's solution, (3) lactated Ringer's solution, (4) hypotonic sodium chloride, (5) hydrochloric acid, (6) ammonium chloride, (7) sodium bicarbonate, and (8) sodium lactate.

Renal insufficiency in dehydration may be due to the lowered filtration pressure caused by dehydration, the presence of actual kidney disease, the lack of water, or both of the latter causes. A good intake of water must be provided.

The daily gastrointestinal loss should be calculated and replaced by parenteral therapy.

The parenteral uses of potassium, fat emulsions, and vitamins are discussed in the light of present information.

The basic information for the administration of nutritional substances is one of the recent great advances, and the ability to maintain a normal environment for the patient's cells has saved countless lives. W. F. MONTGOMERY, M.D.

An Attempt to Evaluate the Different Modern Methods for the Prevention and Treatment of Thromboembolism. J. P. STRÖMBÄCK. *Acta chir. scand.*, 1948, 97: 113.

The retardation of venous drainage is a factor of primary importance in the etiology of thromboembolism. Early ambulation after operation is the best method that is known at present for the prevention of thrombosis. The author believes that it should be begun on the day of operation, or not later than 2 or 3 days following the operation.

Dicumarol may have a valuable auxiliary effect. It should be started on the day after operation and the prothrombin percentage should be kept at from 10 to 30 per cent during the entire period of healing. Dicumarol is contraindicated in patients with liver injury, in those having a tendency to hemorrhage, in cases in which control of bleeding from the wound is incomplete, and in certain renal affections.

The ability to diagnose complications of thrombosis early must be developed by both doctors and nurses. The treatment of manifest thromboembolism with heparin supplemented by dicumarol, as early as possible, followed by early ambulation seems to offer the best guarantee of good immediate and late results.

Venous interruption as a prophylactic or therapeutic measure is not dealt with in the present study. JAMES WEAVER, M.D.

Reconstruction Following Irradiation Injuries. PAUL W. GREELEY. *Arch. Surg.*, 1948, 56: 741.

Radiation injuries may be secondary to necessary treatment for malignancy, may follow overzealous

treatment of cutaneous lesions, may develop in patients with unusually susceptible skin, or they may be due to therapy given with an improperly calibrated machine. Symptoms of x-ray dermatitis are characterized by severe pain, itching, and ulceration. X-ray dermatitis is associated with an obliterative arteritis and hyalinization of the vessels of the involved skin. Subsequently, anemic gangrene or white necrosis with ultimate ulceration follows. The surrounding skin becomes telangiectatic and keratotic. Squamous cell carcinoma may develop in a certain percentage of the latter areas. Because the pathologic reaction is irreversible, permanent cure can be obtained only when the involved tissue is excised up to the area of the normal blood supply. Reconstructive surgery is required for the completion of treatment. The defect may be closed by primary suture with undermining or by a skin graft or skin flaps.

BENJAMIN G. P. SHAFIROFF, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

The Treatment of Open Traumatisms of the Hand in Miners (Tratamiento de los traumatismos abiertos de la mano en los mineros). VICENTE VALLINA GARCÍA. *Cirug. apar. locomotor*, 1948, 5: 450.

The importance of functional integrity of the hands in miners cannot be exaggerated, and 10 years of experience in the care of lesions of the hands has convinced the author that, from the standpoint of subsequent working capacity, an open fracture of a phalanx or metacarpal may be as important as a fracture of the femur, spine, or pelvis. The permanent incapacities observed after more or less important injuries to the hand, the customary resistance to treatment of certain posttraumatic sequelae, and the passive resistance of the patients, who see in invalidity their liberation from the hard and dangerous work in the mines, have stimulated the author's interest in the treatment of these cases.

The surgical procedure to be followed in open traumatisms of the thumb or its metacarpal is totally different from that of the rest of the hand. Functionally, the thumb is the equivalent of half of the hand, and the working future of the patient, to say nothing of the resources of the insurance company, will depend on the behavior of the surgeon, whose constant preoccupation should be to conserve the thumb and never remove it before having done everything possible to keep it, as even a rigid thumb may be very useful to its host.

In traumatic amputation of the thumb, treatment consists only of cleansing the wound with physiologic salt solution, ligating some artery if necessary, and awaiting cicatrization. If the amputation runs through the metacarpophalangeal joint, the skin may be sutured if it is not lacerated.

It may be stated in general that in all other open lesions of the hand the patient is kept in bed for the first 8 days; a sulfonamide, preferably cibazol or sulfathiazole, is administered for from 2 to 4 days; and an abduction splint and a plaster cast are used, the latter extending from the upper part of the forearm to the indicated part of the involved finger.

In open fracture of the phalanges of the thumb, if the patient is seen within 6 hours of the accident, thorough cleansing of the hand is followed by conservative treatment and closure of the wound; if more than 6 hours have elapsed, the wound is left open. In infected fracture, the necessary incisions are made, the fracture is reduced, a vaseline gauze dressing and a closed plaster cast are applied, and 30,000 units of penicillin are given every 3 hours; in these cases the patient is kept in bed up to 2 weeks after disappearance of the fever. If sequestrectomy is necessary after healing, it is performed with minimal traumatism and the avoidance of curettage, which often causes chronic and rebellious osteitis.

Open fractures of the first metacarpal are treated like those of the thumb, particular care being taken in the reduction of the articular fracture of the upper extremity of the bone.

Wounds of the thumb must be treated with the same precautions as those used in fractures because they give rise to the same consequences if they are let alone or incorrectly treated.

In open fracture of the phalanges of the other fingers, the problem is conservation of the function of the hand which is jeopardized by the presence of a finger that impedes the normal movements of the others. Any open fracture associated with extensive detachment of the skin, section of the tendons, lesion of the palmar collateral vessels, or involvement of a joint, must be treated by amputation at the metacarpophalangeal joint. In the other noninfected open fractures the wound is resected and, of necessity, left open in most cases. The digital splint is arranged so that the metacarpophalangeal joint is in 45 degree flexion, the first interphalangeal joint in 90 degree flexion, and the second in 45 degree flexion. From the first day, the nonimmobilized fingers must be moved from maximal extension to maximal flexion, the movements being performed several times each hour.

Infected fractures of the fingers are treated by amputation at the metacarpophalangeal joint.

In open fractures of the second to fifth metacarpals, among which those of the second are more frequent, consolidation is easily obtained even when immobilization is not very strict, because the interosseous muscles help to retain the fragments in place. From the first day, all fingers must be moved to the fullest extent possible. If the fracture is associated with a severe lesion of the skin or section of the flexor tendons, it is preferable to amputate the finger at the metacarpophalangeal joint, or through the focus of fracture if the latter is distal. Fracture of the head of the fifth metacarpal must be treated by immediate amputation at the focus of fracture.

Infected wounds of the fingers with involvement of the tendon sheaths or joints, and diffuse phlegmon of a finger with limited movements of the other

fingers must be treated by prompt amputation at the metacarpophalangeal joint, the wound being left open. The other fingers must be actively mobilized to their full extent of flexion and extension. In contused wounds with detachment of the soft tissues in the palm and exposure or laceration of the tendons it is best to amputate. In tendosynovitis which does not justify amputation, incisions are made on the borders of the fingers.

In recent wounds with section of the tendon, the latter is sutured only when the wound is clean and has been made with a cutting instrument; otherwise, the wound only is treated and suture of the tendon is given attention later. Sectioned extensor tendons of the back of the hand are sutured under these conditions; those of the back of the fingers are sutured and the fingers are immobilized in semiflexion because complete extension impedes flexion of the remaining fingers. If both flexor tendons of the fingers are cut, it is sufficient to suture only one; but when the tendon section is associated with fracture of the finger, amputation is performed.

RICHARD KEMEL, M.D.

The Role of Chemotherapy in Wounds and Surgical Infections. A Study of the Significance of Gram-Negative Pathogens in Fresh Trauma and Chronic Infections. DOUGLAS ACKMAN and FREDERICK SMITH. *Am. J. Surg.*, 1948, 76: 483.

Gram-negative pathogens are not very common contaminants in fresh trauma or in surgical infections. They are found most often in lesions of the lower extremity. They tend to persist, although their presence rarely causes delay in healing. Despite their persistence, these organisms show almost no tendency toward invasion in fresh trauma when the circulation is adequate. Even in cases of gross contamination with gram-negative organisms in pre-existing surgical infections, revision grafts are almost equally immune when local and general physiologic conditions are satisfactory. These local conditions are well maintained by occlusive dressings, infrequently changed. There is no clinical evidence of a symbiotic relation between gram-negative and gram-positive organisms.

Topical application of creams of sulfathiazole, penicillin, and streptomycin have all failed to eliminate gram-negative pathogens in fresh trauma and surgical infections. Streptomycin has caused "fast" organisms in four instances. Some more recent experiences with this drug have been more satisfactory. When invasion by gram-negative organisms does occur, intramuscular streptomycin has given very encouraging results in the few cases so far observed.

JAMES WEAVER, M.D.

Penicillin Therapy with Prolonged Interval Dosage Schedules. W. A. ALTEMEIER. *Ann. Surg.*, 1948, 128: 708.

A study was made of the dosage of penicillin in the treatment of 161 selected cases of established surgical infections in an effort to determine the clinical effectiveness of the single intramuscular injection of larger doses of penicillin in aqueous solution every 8 to 12 hours.

The clinical results obtained in the author's series of selected cases were very gratifying and were probably indistinguishable from those anticipated with injections of penicillin at 3 or 4 hour intervals with the possible exception of 2 cases of severe and extensive infections caused by the hemolytic streptococcus. The experimental and clinical evidence has indicated that for some unknown reason the antibacterial effect of penicillin persists for a considerable length of time after its disappearance from the circulating blood. Although the author's series of 161 cases was relatively small from which to draw any conclusions, it appeared that the maintenance of a more or less constant blood level is probably unnecessary for efficient therapy in the human being. A limited clinical experience revealed that the intramuscular injection of an aqueous solution of penicillin containing from 100,000 to 200,000 units every 8 to 12 hours was an efficient and effective method of chemotherapy in susceptible infections of moderate severity. This method overcomes the disadvantages and inconveniences of the 2 to 4 hour dosage schedule to a large extent and has not resulted in any increased tendency of the bacteria to develop resistance to penicillin.

This dosage schedule of administration of only 2 or 3 injections per 24 hours decreases the task of the nurse and releases part of her time for other more necessary nursing duties. The 8 and 12 hour dosage schedule is advocated at present by the author only in susceptible infections of moderate severity or less, until further experimental information is gathered.

JOHN E. KARABIN, M.D.

Re-Evaluation of Penicillin Dosage Schedules. W. A. ALTEMEIER. *Arch. Surg.*, 1948, 57: 396.

The clinical effectiveness of intramuscular injections of 100,000 units of aqueous penicillin administered every 8 hours and of 150,000 units administered every 12 hours was studied. A single intramuscular injection of 100,000 units of penicillin gave a concentration of 0.03 units per 1 ml. of serum for 3 hours, and in 11 per cent of the patients that concentration was maintained for almost 7 hours. The level of 0.03 units is generally accepted as the therapeutic level.

Five different strains of pathogenic hemolytic Staphylococcus aureus showed a definite inhibition of growth for 24 hours when exposed in vitro to 2 units of penicillin per 1 ml. of medium. Clinically, equal therapeutic benefit was obtained from penicillin when administered intramuscularly every 8 hours as when administered every 3 hours. With penicillin susceptible infections in human cases a constant blood level of the antibiotic was found to be unnecessary since its effectiveness persisted even after the blood penicillin levels were no longer measurable. However, in severe and fulminating infections the 3 or 2 hour schedule was recommended.

BENJAMIN G. P. SHAFIROFF, M.D.

Anthrax: 36 Human Cases of the External Type Treated Successfully with Penicillin. A. C. LaBoccetta. *Am. J. M. Sc.*, 1948, 216: 407.

Anthrax in humans is seen principally as an occupational disease of veterinarians and workers in the wool and leather industries. As no methods for active prophylaxis have been developed, prevention depends largely upon the control of the infection in animals and the employment of general hygienic and sanitary measures. Reports of the Philadelphia Health Department show no tendency of the incidence of the disease to decrease. During the period from 1904 to 1947 there were reported 433 cases within the city with a mortality of 11.5 per cent. Specific antiserum, bacteriophage, and neoarsphenamine have been employed in the treatment of anthrax.

During the period from 1943 to 1947, thirty-six patients with uncomplicated cutaneous anthrax were treated with sodium penicillin in doses of from 100,000 to 200,000 units daily. Bacteriological confirmation of the diagnosis was obtained by smear or culture in 83.4 per cent of cases; in 6 cases (16.6 per cent) the diagnosis was not confirmed bacteriologically, but in the author's opinion the characteristic appearance of the lesions left no doubt of the clinical diagnosis. Of the bacteriologically positive cases 90 per cent became negative after 72 hours of treatment with penicillin. Positive cultures or smears were obtained in 2 patients after 6 and 15 days respectively. In many cases it was seen that the lesions continued to spread and the edema increased for a period of from 24 to 36 hours after treatment had been instituted, a phenomenon commonly observed when patients previously were treated with antiserum. No local treatment other than dry dressings and occasional splinting was used. The author concludes that intramuscular penicillin may be successfully used in the treatment of cutaneous anthrax.

Wayne Field Cameron, M.D.

Treatment of Tetanus. Homer M. Smathers and Milton R. Weed. *Arch. Surg.*, 1948, 57: 291.

A plan of treatment of tetanus was formulated on the basis of experiences with 82 cases, in some of which intocostrin and d-tubocurarine were used. In this series 36 deaths occurred within 48 hours of admission. It was found that enough antitoxin should be given to neutralize the unfixed tetanus antitoxin. When a tetanus-producing focus was found it was eradicated by débridement.

Intocostrin used for the control of muscle spasm was of temporary benefit and was associated with hypersecretion in the laryngotracheal tubes and a profound fall in the blood pressure. The use of d-tubocurarine suspended in wax and oil produced a prolonged curare effect with fewer side reactions. The dose varied from 0.6 ml. to 2.0 ml. daily. For sedation respiratory depressants were avoided; paraldehyde, chloral hydrate, or ether in oil were found to be most satisfactory. The plan of treatment follows:

Preoperative

1. Tetanus antitoxin sensitivity tests—skin and conjunctival
2. D-tubocurarine in wax and oil, 1 c.c. intramuscularly
3. Tetanus antitoxin, 60,000 units intravenously
4. Tetanus antitoxin, 10,000 units locally
5. Preoperative medication

Operative

6. General anesthesia
7. Tetanus antitoxin 20,000 units intrathecally
8. Débridement of wound

Postoperative

9. Sedation—chloral hydrate, paraldehyde, ether
10. Tetanus antitoxin, 5,000 units daily for from 5 to 10 days
11. D-tubocurarine in wax and oil intramuscularly daily to tolerance
12. Penicillin, 50,000 units intramuscularly every 3 hours
13. Maintain nutrition orally and parenterally
14. Available at bedside—nasal oxygen, laryngoscope, endotracheal tube, aspirating apparatus

Benjamin G. P. Shafiroff, M.D.

ANESTHESIA

Certain Factors Influencing the Percentage of Oxygen in Mixtures of Nitrous Oxide and Oxygen. James H. Crowley, Albert Faulconer, Jr., and John S. Lundy. *Current Res. Anesth.*, 1948, 27: 255.

The authors report a study of certain factors which govern the percentage of oxygen available to a patient when mixtures of nitrous oxide and oxygen are administered by a circle-absorption semiclosed technique.

A description is given of the techniques used in this study.

Observations were made with the use of mixtures of nitrogen and oxygen which were found to behave, with certain limitations, in a manner similar to mixtures of nitrous oxide and oxygen.

The percentage of oxygen available to the subject was found to be much less than the percentage of oxygen delivered to the machine when slow total rates of flow were used. The more rapid the total rate of flow the more nearly did these percentages approach equality.

An important factor in the reduction of the percentage of oxygen available to the patient was found to be dilution of the nitrogen of the "bag mixture" during the first few exhalations of the subject.

Recommendations were made by which the dangers of incorrect estimation of the oxygen might be eliminated.

SURGICAL INSTRUMENTS AND APPARATUS

New Incisions and Revised Techniques in Peripheral Surgery. Emil Seletz. *West. J. Surg.*, 1948, 56: 565.

The central theme of the present article is that of the surgical principles and problems involved in obtaining good exposure for definitive treatment of

peripheral nerve injuries. A series of diagrams and photographs is presented to illustrate various incisions and approaches advocated by the author for the exposure of nerves in the extremities. The conclusions are based on experience gained from the study and operative repair of 2,037 nerve injuries during the war years.

The incisions and surgical approaches employed by the author are based on principles involving a more direct surgical approach to obtain adequate exposure of the injured nerve. The approach is made through fascial planes rather than through muscle substance. If it becomes necessary to incise muscle tissue, the incision should always be made in the direction of its fibers. When a muscle must be divided it is severed only at its point of fascial attachment so that it may be easily repaired. Skin incisions which are perpendicular to flexion creases must be avoided since a traction scar will invariably result. Not only is the skin involved in the production of contractures, but there is involvement of the subcutaneous tissues and fascial layers as well.

In cases in which the surgical exposure involves a joint area, the incision should generally be an interrupted one. This may be accomplished in one of two ways: when the involved joint is in the cubital or popliteal space, a Z-shaped incision, as described by the author, is used; when exposure is needed on either side of a joint in a limited area, as in the wrist, the incision is interrupted and the area between is tunneled so as to provide adequate exposure. ORVILLE F. GRIMES, M.D.

A Simple Method of Estimating Blood Flow with Special Reference to the Circulation in Pedicled Skin Flaps and Tubes. WILFRED HYNES. *Brit. J. Plast. Surg.*, 1948, 1: 159.

The author states that a precise knowledge of both the arterial supply and the venous drainage of a pedicled flap or tube at each stage of its transfer has the following advantages:

1. The periods of waiting between the stages of the transfer can be reduced, sometimes by half. Besides shortening hospitalization, it reduces the amount of scar tissue under the flap or inside the skin tube so that the tissues remain soft and pliable and require practically no trimming at the new inset.

2. Pedicles can be divided with confidence, and tiresome scar-producing division by delay can be avoided.

The methods advocated by Lewis, Douglas and Bucholtz, Douglas and Millican, and Lange and Boyd are discussed briefly.

The author's method, which he believes is simplest and gives the most complete information regarding the circulation, consists of the injection of 1/25th of a grain of atropine sulfate, dissolved in 0.2 c.c. of sterile water, into selected sites on the flaps or tubes. If a tubed pedicled flap is to be tested, a bowel clamp with the blades protected by rubber tubing is placed firmly across the end to be detached and the atropine injected just below it. If an open or direct flap is to be tested, a tourniquet is placed around the donor extremity and the injection is made in the most distal portion of the flap. By timing the appearance of three specific effects of atropine in the circulation, an estimation of the blood flow in a flap can be obtained.

Tachycardia is the most reliable sign of atropine absorption; 1/25th of a grain injected subcutaneously in the face of an adult raises the pulse rate from 72 to 104 in a period of 10 minutes and to 118 in a period of 20 minutes.

Changes in the pupil do not necessarily occur early, and a better test is the inability to read an ordinary newspaper. Inability to focus properly will occur in from 15 to 45 minutes.

Dryness of the mouth starts as a tingling sensation in the lips or in the back of the throat and is quickly followed by a feeling of increasing dryness in the mouth, throat, and larynx within 15 minutes after injection of 1/25th grain of atropine subcutaneously in the face.

Accurate timing of the appearance of the above three signs of atropine absorption, following its injection into a flap or tubed pedicled flap, will result in a reliable estimation of the blood supply both qualitatively and quantitatively.

EARL H. KLABUNDE, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

An Evaluation of Phlebography of the Normal Lower Extremity. BERNARD S. EPSTEIN, MILTON G. WASCH, and LEO LOEWE. *Am. J. Roentg.*, 1948, 60: 650.

Acting upon their belief that the value of phlebography cannot be properly delimited until the range of normal variation has been thoroughly studied, the authors made phlebograms of a lower extremity in each of 35 patients who were free of any clinical evidence of pre-existent venous disturbance. The patients selected were those in whom intravenous urography was being done. Twenty cubic centimeters of either diodrast or neo-iopax in 50 per cent solution were injected within 60 seconds into a superficial vein on the dorsum of the foot or over either malleolus, with the leg placed in slight inversion. Immediately upon completion of the injection roentgenograms (made in quick succession) were centered, respectively, below the knee joint, just above it, and below the groin. In the last 8 patients, roentgenographs were taken in the lateral as well as the anteroposterior position, for better visualization of the leg veins. One-half of the first 20 examinations were conducted with a compression of 30 mm. of mercury maintained about the calf, but when no difference could be observed in the phlebographic patterns obtained with and without compression, it was concluded that compression had not been of assistance in visualizing the deep venous system, and the practice was discontinued.

The authors review the normal anatomy of the venous system of the lower extremity, both superficial and deep, as a basis for evaluation of their radiographic observations. The latter consisted in an attempt to identify each vein visualized, and a review of the general venous pattern. They found that the lesser saphenous vein was excellently visualized in 6 patients, partially visualized in 26 patients, and not seen at all in 3. The long saphenous vein was well visualized in 10 individuals, partly visualized in 16, and invisible in 9. Visualizations of the deep veins of the leg were uniformly poor. In no instance was clear demonstration of paired anterior and posterior tibial and peroneal veins, as 6 well filled channels, achieved on the same patient. Almost all patients had some degree of opacification of a single anterior or posterior tibial or peroneal vein. Variations in caliber, and sudden transitions from filling to nonfilling were common. Occasionally a few transverse communicating channels were seen. The proximity of the channels of peroneal and anterior tibial veins made identification difficult if only one of these channels, or a part thereof, was visualized. Deep veins were somewhat better visualized in the anteroposterior view, while superficial veins and veins of the calf were better seen in the lateral projection. The pattern formed by the latter appeared inconstant. Overlapping of the various systems further complicated interpretation.

The popliteal vein was excellently visualized in 21 patients, and partially visualized in 14. The femoral vein was well seen in 20 individuals and was only irregularly filled in 12; in 3 cases it was not seen. Filled collateral channels were occasionally demonstrated, and in 2 patients the deep femoral vein was opacified.

The authors comment that incomplete or irregular filling, or absence of filling of the leg veins has been considered by some workers as indicative of thrombosis, but they conclude from their work on these 35 clinically normal individuals that there is need for great circumspection in evaluating phlebographic patterns obtained by the usual techniques, particularly in the leg. They believe that phlebography cannot be considered a proved aid in the diagnosis of thrombophlebitis because the inconstancy of the patterns found in normal patients often makes it impossible to differentiate between the normal and abnormal. LILIAN DONALDSON, M.D.

The Possibility of Venous Embolism in the Course of Hysterosalpingography (Sulla possibilità di embolie venose in corso di isterosalpingografia). MAURO PIEMONTE and PIERO PARACCHI. *Radiol. med.*, Milano, 1948, 34: 682.

Approximately 30 cases of venous embolism following hysterosalpingography have been published in the literature. In the majority of cases the course is asymptomatic or only slight symptoms such as cough are present. Occasionally, however, pain in the hypogastrium, the formation of multiple emboli and infarcts in the lungs, obstinate cough, hematemesis, pain in the chest, anxiety, and rise of temperature may be observed. If the iodized oil reaches the left part of the heart, multiple cerebral emboli may form, leading to mental depression, loss of memory, and focal symptoms, such as amaurosis.

As a rule, the clinical course of venous emboli formed by iodized oil is favorable. Only 2 fatal cases have been reported.

Two factors favor the formation of emboli in the course of hysterosalpingography: (1) pre-existing disruption of the continuity of the endometrium: (a) physiologic, namely, during the immediate postmenstrual period, and (b) pathologic, caused by traumas or neoplasms; and (2) excessive endouterine pressure. Even the moderate pressure under which iodized oil is injected may lead to disruption of the endometrium and entry of the radiopaque substance into a vein, when the resistance of the uterine mucosa is lowered, the tubes are occluded or had been removed operatively.

The author employed hysterosalpingography in a woman, aged 55, who was admitted with complaints of slight uterine bleeding. The clinical diagnosis was

fibromyoma. After an injection of 15 c.c. of iodized oil into the uterine cavity, the right uterovaginal and pampiniform plexus and the left uterine vein were visualized. Roentgenograms of the chest demonstrated a uniform distribution of oil throughout the lungs. A sensation of constriction over the chest, dyspnea, profound asthenia, cyanosis, moist cough, headaches, and subfebrile temperature developed.

Two months later subtotal hysterectomy and bilateral salpingo-oophorectomy were performed. The atrophy of the mucosa overlying the fibroma probably facilitated the entry of the oil into the veins.

JOSEPH K. NARAT, M.D.

Irradiation in Cancer of the Tongue. CHARLOTTE P. DONLAN. *Am. J. Roentg.*, 1948, 60: 511.

The author reviews 83 proved cases of carcinoma of the tongue in patients who were treated in the Radiotherapy Department of Presbyterian Hospital, in New York, during the period between 1929 and 1946. The treatment of the tongue lesions consisted of the interstitial implantation of radium needles in the tongue plus roentgen irradiation, and roentgen irradiation alone. An attempt was made to give 8,000 gamma roentgens or more to the tongue when interstitial radium needles were used. Supplementary roentgen therapy was given if the radium dosage was less, or if the lesions tended to persist after the usual dosage had been given. When roentgen therapy alone was used, the aim was to give a tumor dose of 5,000 to 6,000 roentgens. The cases were classified as operable cases, inoperable cases, and borderline cases.

Twenty-two cases were classified as operable. The average duration of symptoms in this group was 9.25 months. Ten of 19 patients survived for over 5 years, a survival rate of 52.6 per cent. (Three patients were admitted after 1942 and therefore could not be included in this percentage rate.) Seven of the 10 patients who survived had neck resections, 4 of which were bilateral. Of these 4, only 1 patient showed histopathological evidence of disease in the nodes.

Nine cases were classified as borderline. The average duration of symptoms was 7.4 months. None of the patients survived 5 years, although 2 cases are too recent to have attained that survival period; both patients are living and well. In 1 patient a unilateral neck resection was performed 5 months after treatment of the tongue lesion; 1 had a pulmonary and esophageal metastases; and 1 had metastases to the femur.

There were 34 inoperable cases in which the average duration of symptoms was 7.5 months. The condition of the nodes was mentioned in 30 histories and of these, 12 had palpable nodes on admission. Only 4 of these 12 had neck dissections.

Two patients had unilateral neck dissections before receiving treatment for the primary lesion. In both of these cases the primary lesion was in the base of the tongue and difficult to diagnose.

Five of 23 patients lived 5 years or more, a survival rate of 21.7 per cent. Eleven cases were admitted after 1942 and therefore could not be included in the percentage.

Eighteen patients with inoperable lesions were treated by roentgen irradiation alone. The average duration of their symptoms was 5.8 months. In 2 of these 18 cases, pulmonary metastases developed.

Eight patients (44.5 per cent) had palpable nodes on admission. No neck dissections were done.

Two of 13 patients (16.9 per cent) lived over 5 years. Six patients had been admitted too recently to be included in this percentage group.

Among the 55 cases admitted up to, or before, 1942, there was an over-all 5 year survival rate of 30.9 per cent.

FRANK L. HUSSEY, M.D.

The Roentgen Treatment of Carcinoma of the Larynx by the Concentration Method (El tratamiento radiologico del carcinoma laringeo por el metodo de la concentracion). RAÚL MAYER. *Dia méd.*, B. Air., 1948, 20: 2210.

The author irradiated 216 patients with carcinoma of the larynx. Of this group, 123 were treated by radiation alone. The remaining 93 were treated for recurrences that followed surgery.

The Coutard method was used exclusively until 1942. The Coutard-Cutler or "concentration method" was developed soon thereafter and has been used since.

The Coutard method for treating laryngeal cancer was first used in 1933. During that year and in 1934, 18 patients were treated and of these, 3 were living and well at the end of 5 years (15.6%).

From 1935 up to and including 1937, 32 patients with inoperable laryngeal cancer were similarly treated, and of these, 8 (25%) remained well for from 5 to 7 years.

During the period from 1938 up to and including 1941, 38 additional patients were irradiated by the Coutard method. Of the latter, 9 (23%) remained well for 5 years.

The Coutard technique first used roentgen rays generated at 185 kv. with 5 ma. In July of 1938, the voltage was changed to 200 kv. with 10 ma. The distance remained constant at 70 cm. with 2 mm. of copper plus 2 to 3 mm. of aluminum filtration. The fields varied in size from 49 to 144 sq. cm. Usually from 5,000 to 8,000 roentgens were delivered at a rate between 2.5 and 7 roentgens per minute in 6 to 12 days.

The Coutard-Cutler technique was developed in 1942. Roentgen rays generated at 200 kv., delivered at a distance of 70 cm., with a filtration of 2 mm. of copper plus 2 mm. of aluminum plus 3 mm. of bakelite, were used. The milliamperes were varied in order to assure a tube output between 5.5 and 8 roentgens per minute.

Two lateral fields, one on each side of the neck, were treated daily, one in the morning and the other 6 hours later in the afternoon of the same day. The 6 hour interval was decided upon because severe re-

actions developed when a shorter period of time between the daily exposures was used.

As a rule two portals (each 100 sq. cm.) were used, 1 portal being directed into each side of the neck. The smaller or localized laryngeal cancers were also treated through 2 portals, each of which measured 64 sq. cm. The fields are gradually reduced in size until they reach a minimum of 9 sq. cm. in some cases.

No attempt is made to treat the involved cervical lymph nodes until the primary lesion has been adequately managed. Thereafter, the nodes are treated, care being taken to protect the previously irradiated areas.

The authors deliver 100 roentgens to each of the two fields daily. The daily exposure to each field is increased 25 roentgens until both fields receive 475 roentgens per day, a total of 950 roentgens daily. The treatment is usually completed in 16 days, at the conclusion of which time the patient usually has received 9,350 roentgens. The daily exposure is somewhat less in the presence of severe infection, for which penicillin is used freely.

In most instances a dry radioepidermitis develops, which is less severe than the skin reactions usually observed when the old Coutard technique was employed. The authors believe that the "concentration" technique is less exhausting to the patient than the old Coutard technique.

During the interval from May, 1942 to October, 1945, the "concentration" technique was used on 35 patients. Of this group, 13 (37.1%) remained well for from 2 to 5 years.

EUGENE P. PENDERGRASS, M.D.

Spindle Cell Tumors of the Gastrointestinal Tract. WILLIAM L. PALAZZO and MILFORD D. SCHULZ. *Radiology*, 1948, 51: 779.

The authors prefer the term "spindle cell tumor" to describe those tumors arising from mesodermal tissue, because the usual classification as neurinoma, neurofibroma leiomyoma, or fibroma becomes so difficult in the malignant tumors.

The study is based on 140 cases of histopathologically proved spindle-cell tumors of the gastrointestinal tract. They were found in 0.67 per cent of 12,000 protocols of autopsies and in 1.2 per cent of 5,313 surgical records at the Massachusetts General Hospital. Of the total, 9 per cent were located in the esophagus, 65 per cent were located in the stomach, 17 per cent in the small intestine, and 9 per cent in the large intestine. Spindle cell tumors accounted for 2.3 per cent of all esophageal tumors removed in a 16 year period, for 5 per cent of those in the stomach, for 7 per cent of those in the small intestine, and 0.2 per cent of those in the large intestine.

Thirty-three per cent of spindle-cell tumors of the esophagus, and 36 per cent of spindle cell tumors of the stomach were malignant. Recurrence or metastasis, if present, was evident within 4 years; 54 per cent of the patients remained well and free of the disease for an average of 8 years. In the small bowel, 7 (77%) of the spindle cell tumors were malignant and none of these patients remained free of disease for more than 3 years. Six (86%) of these tumors of the large bowel were malignant and one patient of this group is without disease 5 years after operation.

In discussing the criteria for roentgen diagnosis, the authors state that in their experience, smoothly circumscribed intramural tumors without ulceration or marked lobulation are more often benign, or are benign extrinsic lesions. This diagnosis is more reliable in the esophagus than the stomach. However, they conclude that there are no reliable criteria by which benignity of a spindle cell tumor can be recognized in the roentgen examination. In addition, the authors state that these tumors cannot be differentiated from cysts of the esophageal wall, mediastinal cysts, or tuberculous lymph nodes attached to the esophageal wall, aberrant pancreas, and even defects due to vascular anomalies.

PAUL R. NOBLE, M.D.

MISCELLANEOUS

Some Tracer and Therapeutic Studies with Artificial Radioactivity. J. H. LAWRENCE. *Brit. J. Radiol.*, 1948, 51: 531.

The author briefly discusses the formation of artificial radioactive isotopes by use of the cyclotron and atomic pile. Tracer studies have been conducted upon patients with rheumatoid arthritis by measuring the circulation time of radioactive sodium chloride. It is found that persons with this disease have a reduced circulation time and the uptake of radiosodium is reduced.

Radioactive gold sodium thiosulfate has been given intravenously to rabbits suffering from chemically induced arthritis, as well as to controls. A relatively high uptake was found in the liver, kidneys, and the involved synovial membrane.

A discussion of polycythemia vera is presented in addition to the therapeutic application of P_{32}. More than 100 patients have been treated by the selective uptake of radioactive phosphorus in the bone marrow. Two doses of 5 mc. each are given intravenously 1 month apart. One course of therapy has usually resulted in the return of the red count to normal, decrease in size of the spleen to normal, or nearly so, and relief of all symptoms of the disease.

In 116 cases of polycythemia, the author found the average age of onset was 49, and of 18 patients who died, the average age at death was 67. This series was compared to another series of 163 patients in this country of whom only 36 lived more than 5 years after the diagnosis was made. Previously, the common causes of death were thrombosis in the veins or arteries, cardiac failure, or leucemia. In the present series, thrombosis was rare, perhaps related to the depression of the red cells and platelets as a result of irradiation and return of the blood viscosity to normal, and possibly due also to some other cause

of clotting of the blood. Four of this group of patients developed leucemia. In 250 patients with chronic leucemia, the average length of life approached 5 years. This method of treatment has given results not completely satisfactory, but it is devoid of the usual radiation sickness.

The use of I-131 in the treatment of hyperthyroidism and certain thyroid gland malignancies is noted. This centers about the selective localization of iodine within the thyroid gland in excess to other tissues. Hyperthyroid patients usually do not suffer a recurrence of symptoms and signs after one course of therapy.

The author briefly touches upon the surface application of P_{32} by blotting paper for the treatment of cancers of the skin. In addition, the subject of radioactive colloids and labeled compounds as applied to medical research is presented.

HORACE G. BUTLER, M.D.

Radioactive Iodine as a Diagnostic Aid for Intrathoracic Goiter. G. ANSELL and J. ROTBLAT. *Brit. J. Radiol.*, 1948, 51: 552.

An intrathoracic goiter is considered by the authors as complete when four-fifths or more is in the thorax, and incomplete if at least one-half of it is palpable in the neck. This is further localized by the anterior, lateral, or posterior position.

A list of lesions and differential points from a radiological standpoint is presented according to the three positions occupied by an intrathoracic goiter. Doubt has existed in some few cases as to the diagnosis of such lesions and radioactive iodine was used for differentiation. The authors have administered a tracer dose of radioactive iodine in 5 such cases and include a description of their method and a case report.

A counter was built with sufficient lead shielding to stop gamma rays coming from any thyroid tissue in the neck, so that counts from only the chest would be recorded. The counter, in spite of its weight, was made quite mobile and did not support itself upon the patient's chest. A diagram of the counter and shield is recorded. A lead collimator of 1 inch diameter was used in order to count smaller and more precise areas.

Experimentally, it was found feasible to map out the area in which radiation was contained by moving the counter over the area and measuring the activity at various points. A lead marker was placed on the chest wall to the left of the manubrium sterni and films were obtained in the posteroanterior and lateral positions.

Twenty-four hours before counting, 90 microcuries of I-131 were given. The counts were taken over various areas of the anterior chest and neck, and the areas were marked by a circle of adhesive plaster containing a number and the number of counts. A photograph was taken at the completion of counting and the lead marker served to correlate the position of the counts with the roentgen illustration.

The number of counts per time interval was plotted against the distance of the source from the central position of the axis of the counter, and an analysis of the results was made in order to determine the position of the goiter. The contour of the thyroid determined from the measurements agreed fairly well with the roentgenogram in spite of some impairment of accuracy. The curvature of the chest prevented the collimator from being flush with the chest wall in some areas, which caused a degree of error. Other errors may be created by an intrathoracic goiter of nonuniform consistency or of varied distance from the chest wall.

The authors point out that the majority of intrathoracic goiters will have sufficient uptake to be outlined. Large cysts within the mass may alter the estimation of contour. It is pointed out that only 15 per cent of thyroid carcinomas take up radioactive iodine and therefore such lesions could not be ruled out by this procedure. HORACE G. BUTLER, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Parenteral Feeding of Protein. ROBERT ELMAN. *Arch. Surg.*, 1948, 57: 185.

The value of parenteral protein feeding depends (1) on the importance of protein feeding itself, and (2) on the availability of adequate methods. The old idea that protein is available from the large dispensable body stores has been discarded. A basic principle in the treatment of disease is that all deficits should be avoided.

There are two general conditions in which the parenteral administration of protein is indicated. When there is a deficit of hemoglobin and plasma they are administered intravenously in the form of whole blood. The second condition, that of a deficit of protein food, presents a different problem of parenteral administration. Protein food normally becomes available to the body in the form of amino acids or combinations thereof.

For parenteral administration it is necessary to have a protein containing the minimum amount of essential amino acids. A second requirement is that the mixture provoke no serious consequences when injected either subcutaneously or intravenously. Solutions of hydrolyzed protein which we use at present must be mixtures of only pure amino acids.

Studies of the efficacy of protein food are discussed or suggested by the author under six categories as follows:

1. The maintenance of nitrogen balances
2. The effect on regeneration of plasma protein
3. The demonstration of tissue protein synthesis
4. The ability to promote normal growth in rats
5. The ability to promote normal weight gain in adult animals
6. Analysis of the protein for essential amino acid content

The author discusses the clinical observations which give evidence of the benefit of parenteral administration of protein to surgical patients. The author suggested that parenteral administration will control the patient's feeling of hunger. The use of parenteral administration in a special group of cases, patients with intestinal fistulas, is recommended. The theory of protein metabolism which maintains that plasma proteins are actually a medium of exchange between foods and body proteins is also discussed.

For the immediate nutrition of tissues, amino acids should be introduced in amounts of 100 gm. or more a day plus the same amount of dextrose, together with some salt and vitamins. Whole blood should be given in addition, largely to restore the red cell mass to normal. Plasma transfusions will be of value to increase the level of plasma protein. The salt content of plasma is a disadvantage, but it has been eliminated by the newer preparation of salt-poor albumin which has proved to be more valuable.

W. F. MONTGOMERY, M.D.

The Effect of Caronamide with Heparin on the Coagulation of Human Blood. HOWARD D. SIRAK, ROBERT S. MCCLEERY, and CURTIS P. ARTZ. *Surgery*, 1948, 24: 811.

Caronamide has been used to prolong and augment the blood level of penicillin. When given orally, caronamide inhibits the tubular excretion of penicillin as well as paraminobenzoic acid, diodrast, and other compounds totally unrelated structurally to caronamide. Since heparin levels, like penicillin levels, are hard to sustain, it was believed that the effect of caronamide with heparin might be similar to that of caronamide with penicillin, making it more effective and less expensive to administer.

Ten patients were studied and the effect of caronamide with heparin was determined by performing heparin tolerance tests on successive days before and after the administration of caronamide.

The results were studied by determining the maximum response, the intermediate response, the minimal response, and the group averages in all patients. Heparin levels and prothrombin determinations were recorded and the time relationship of the administration of the two drugs was investigated.

The authors demonstrated that caronamide administered as a single 4 gm. dose, or as a course of multiple doses, markedly increased the effect of heparin on the coagulation time of human blood. Intravenous heparin in saline solution, given one-half hour after a single dose of caronamide, caused a progressive enhancement of the effect of an equal dose of heparin administered on each successive day.

In 8 of the 10 patients studied, this enhancement reached a peak in approximately 3 days and was manifested by a two to tenfold increase in response of the coagulation time to heparin. The peak was followed by gradual return to a normal response 2 to 3 days later.

Incomplete evidence suggested that the effect obtained in these cases was probably due to the formation of a new compound and not to a caronamide blockage of the renal excretion of heparin.

The fact that the enhancement of small doses of heparin can be achieved with the use of caronamide makes the outlook very promising for a reduction in the cost of heparin therapy.

JOHN E. KARABIN, M.D.

Carcinogenic and Anticarcinogenic Substances. E. C. DODDS. *Lancet*, Lond., 1948, 2: 837.

The production of chimneysweep squamous epithelioma, mule spinner carcinoma, cancer of the mouth, and other forms of carcinoma was long supposed to be a very slow process attributable to gen-

eral nonspecific chronic irritation acting over a long period. Subsequently it was proved that there was something extremely specific about the irritating action of soot. Commencing in 1921, Kennaway and his coworkers demonstrated that carcinogenic substances could be formed from materials containing only carbon and hydrogen, which led to the synthesis and isolation, from tar, of carcinogenic polycyclic hydrocarbons. Biological investigation revealed big differences in the quantitative activities of various compounds. The author points out objections to the concept that long-term irritation is necessary for the production of cancer.

Thus, in cancer of the penis the carcinogenic potentiality is conferred during the first few years of life and in spite of subsequent circumcision, malignancy occurs several decades later. Certain forms of industrial cancer similarly develop long after comparatively short exposure, e.g., cancer of the respiratory passages from exposure to dust in the carbonyl process; carcinoma of the bladder from B-naphthylamine and benzidine used in dye processing; pulmonary neoplasia similar to sarcoidosis as a result of beryllium dust.

Evidence points to the fact that the body itself can produce substances (estrogens) which change tissues to such an extent that they may later develop into carcinomas. Possibly other factors are involved in this malignant transformation.

Efforts to render the organism insensitive to carcinogens have generally proved to be disappointing. Only one method of protecting sensitive animals from the carcinogenic action of polycyclic hydrocarbons on the skin has been found and this immunity is only temporary (mustard gas). Extensive studies on a heterogenous collection of supposedly anticarcinogenic substances have shown that some possibly exert slight beneficial effects. It appears probable that this is the consequence of a nonspecific action on the general health of the animal rather than a specific action on the growth itself. Several studies emphasize the fact that diet may play some part in malignancy.

Opinion is divided as to the influence on cancer of the folic-acid group of substances (diopterin and, particularly, teropterin). However, interest appears to have largely evaporated. A group of compounds, known as antifolic acid substances, has also been intensively investigated since these compounds seem capable of damaging malignant cells. Promising results appear to have been obtained clinically with one of these agents, A-methopterin.

Coley's fluid has not given uniform results and therefore its administration has been generally discontinued. Stilbestrol, by its action on the anterior lobe of the pituitary gland, effects a kind of biochemical castration and thereby controls the local and secondary growths of prostatic cancer for a prolonged period. This was the first highly successful attempt with chemotherapy in the control of cancerous conditions.

The author points out that androgens are not entirely foreign to the female and therefore their empirical employment is unwarrantable. Opinion is reserved as to the effectiveness of testosterone propionate in mammary or genital tract carcinoma in women. The palliative use of nitrogen mustard has proved, on occasions, to have some beneficial effects, at first. Urethane has similarly been administered for its palliative action on blood-forming organs.

Thus, while there are a great many ways of producing cancer, with no fundamental connection between them, once the process commences we have no means of stopping or checking it by direct action. All the anticarcinogenic substances and agents act indirectly.

DAVID H. LYNN, M.D.

EXPERIMENTAL SURGERY

Studies in Cellular Growth. MAXWELL MALTZ. *Brit. J. Plast. Surg.*, 1948, 1: 187.

Anti-mouse and human granulation tissue serums were prepared by injecting rabbits with antigens prepared from these two tissues. Wounded mice injected with small amounts of these sera showed accelerated healing. Larger amounts of the serum derived from mice retarded healing, whereas larger amounts of the serum derived from human granulation tissue had no retarding effect. Small doses of the serum from mouse granulation tissue plus small doses of an antisplenic serum stimulated cellular growth of sarcoma 180 in mice. A stimulating dose of the antisplenic serum plus a larger dose of the anti-mouse granulation tissue serum retarded and destroyed growth of this sarcoma.

This same combination retarded and destroyed spontaneous breast carcinomas in mice.

JAMES WEAVER, M.D.